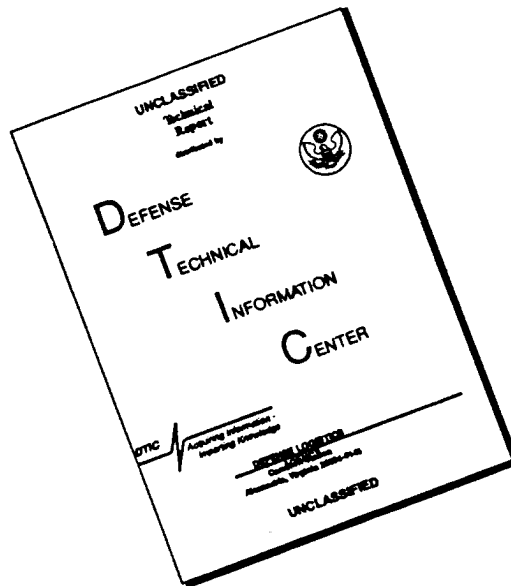




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JULY - AUGUST 1996

# PROGRAM MANAGER

DoD 5000 Series Roll-out

Third PEO/SYSCOM Commanders/PM Conference

Foreign Comparative Testing

**"Finding Military Advantage Based on Technology"**



MODELS & SIMULATION

INFORMATION TECHNOLOGY

—Anita Jones

A B I M O N T H L Y M A G A Z I N E O F T H E D E F E N S E

# PROGRAM MANAGER

Vol XXV, No. 4, DSMC-133



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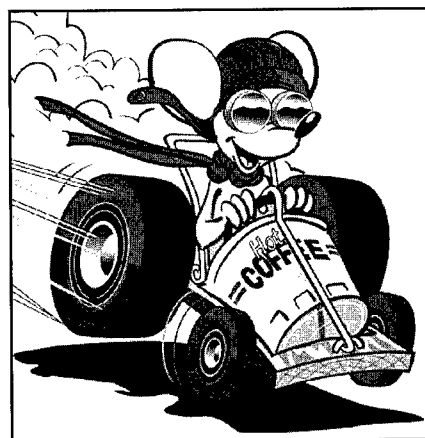


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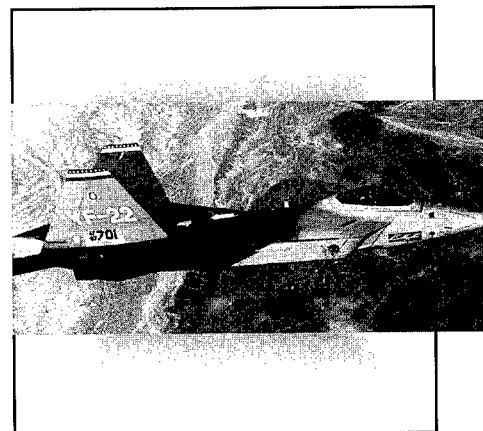


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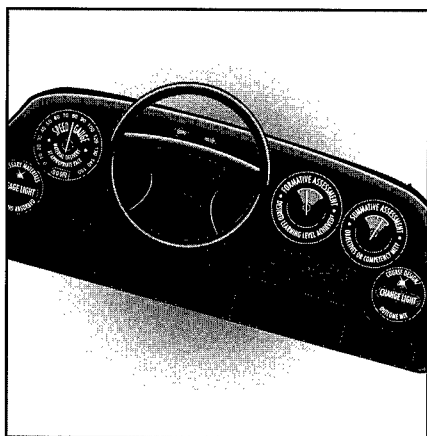
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# Program Manager Interviews Anita Jones, Director, Defense Research And Engineering

**“Technology is Changing the Way Literally Everything in the Department of Defense is Being Done”**

Filling a position previously held by such notables as Secretary of Defense William Perry could certainly be viewed as a tough act to follow. Dr. Anita K. Jones, the current Director of Defense Research and Engineering since June 1993, easily fits the role. Jones, a computer scientist and former member of many defense scientific advisory groups, is spearheading the effort to bring the government's science and technology program into the information age.

On March 28, 1996, *Program Manager* spent an hour with Jones. Whether discussing major DoD senior leadership policies and initiatives, affordability, DoD laboratories, downsizing, or the capabilities of Stealth or Predator, Jones speaks with authority and an amazing grasp of detail. She knows exactly where we [DoD] are in the realm of science and technology as it relates to our nation's defense posture, where we're going, and articulates a clear vision of how we're going to get there.

Throughout the interview, she constantly returned to the theme of supporting the warfighter, and giving him or her that extra edge in battle through the medium of information technology. She also spoke of leaving a legacy for those warfighters in the decades ahead—a legacy that must be



DR. ANITA K. JONES, DIRECTOR, DEFENSE RESEARCH AND ENGINEERING SPEAKS TO *PROGRAM MANAGER*'S REPRESENTATIVES FROM HER PENTAGON OFFICE ON MARCH 28, 1996.

built and sustained with today's scientific and technological programs.

We left the interview with the impression that absolutely nothing will deter Jones from using every scientific and technological resource at her disposal to give America's warfighters that extra edge in battle through the medium of information technology. The interview speaks for itself. Let Jones, in her own words, tell you how her office is

preparing this nation's defense apparatus to meet the global scientific and technological challenges we face well into the next century.

**Program Manager:** As Director, Defense Research and Engineering, would you please describe your job for our readers?

**Jones:** My job is oversight of the science and technology program for the

*Mr. Greg Caruth, Director, DSMC Visual Arts and Press, and Ms. Collie Johnson, Managing Editor, Program Manager Magazine, conducted the interview with Dr. Jones on behalf of the DSMC Press. Program Manager gratefully acknowledges the assistance of Ms. Ann Cornett, Confidential Assistant to Dr. Jones, in the coordination and preparation of this interview.*

Department of Defense, and that means the programs that are very long-term research programs, to medium-term, to late-stage technology maturation programs, and they're executed out of the Military Departments and out of the Agencies in the Department of Defense. The people who do the work are in universities, industry, and in our own DoD laboratories.

**Program Manager:** Would you tell us about your background and experience.

**Jones:** I'm a computer scientist by training and by trade, and have long worked with the Department of Defense, mainly in an advisory capacity, with the Air Force on the Air Force Scientific Advisory Board; and more recently with the Defense Science Board, which is the senior science advisory board for the Secretary of Defense.

**Program Manager:** Could you summarize your overarching strategy toward science and technology?

**Jones:** The primary objective is to develop technology-based options so that our warfighters out in the future have an advantage that is based on technology.

**Program Manager:** Along with that, how would you characterize the direction taken by this Administration in the area of science and technology and how it has evolved?

**Jones:** One of the objectives that Secretary Perry set very early on was to sustain DoD's investment in science and technology so that today's leadership provided a legacy for those who come decades after. When Secretary Perry was the Director of Defense Research and Engineering, he started the Stealth Program, and is looked on by many as the father of Stealth. And that was the legacy of the leadership that was there with him at the time, creating the forces that fought in Desert Storm where the F-117 Stealth aircraft, night vision, and precision

## DR. ANITA K. JONES

*Director, Defense Research and Engineering  
Department of Defense*

**H**on. Anita K. Jones was sworn in as the Director, Defense Research and Engineering on June 1, 1993. She is responsible for management of science and technology programs of the Department of Defense and oversight of in-house laboratories, university research initiatives, and the Advanced Research Projects Agency.

Jones' previous government assignments were advisory. She has been a member of many scientific advisory groups such as the Defense Science Board, Air Force Scientific Advisory Board, National Aeronautics and Space Administration (NASA) Space Science and Applications Advisory Committee's Communications and Information Systems Subcommittee, and various panels of the National Research Council and National Academy of Sciences. She has received the Meritorious Civilian Service Award from the U.S. Air Force.

Her private-sector experience includes serving as Professor and Chair of the Department of Computer Science at the University of Virginia; Vice President and founder of Tartan Laboratories; member of the Board of MITRE Corporation; and member of various academic advisory boards, including the Massachusetts Institute of Technology Lincoln Laboratories Advisory Board. She has published more than 35 technical articles and two books in the area of computer software and systems. She is a member of the National Academy of Engineering and a Fellow of the Association for Computing Machinery.

Jones received her A.B. from Rice University in mathematics. She earned an M.A. from the University of Texas, Austin, in literature, and a Ph.D. in computer science from Carnegie Mellon University. Her husband is Wm. A. Wulf, the AT&T Professor of Engineering and Applied Science at the University of Virginia. They have two daughters, one living in the Seattle, Washington, area and one in Bethesda, Maryland.



strike assets performed so well. And now it's our turn to provide a legacy for the military who will follow in later decades.

**Program Manager:** The Science and Technology Program — how is it generally framed?

**Jones:** First of all, the Department of Defense has invested in science and technology for decades. And that investment has played an important part in many fields. Some are specific to the military, but some are also

important to our economy. For example, information technology — it's a very important set of technologies today. If you look at a major technology-based change in the equipment that we're able to field, it often, in fact usually is dependent on new technology that comes along.

If you again take Stealth as an example, back in the 1970s DoD was investing in basic materials that were later used for radar-absorbing materials. DoD invested in the development of the mathematics used for the codes

needed to design the Stealth signature of an aircraft. Then in the late '70s and early '80s, we were doing later-stage technology development, actually building the radar-absorbing materials and trying to affix them to the outer side of an aircraft, and designing low-radar cross section parts of aircraft such as sensors, engine inlets, and exhausts. It takes decades for such technology to mature if it's really a revolutionary change, as Stealth was. That's the kind of activity that we engage in.

We have a planning process by which we start with the policy guidance of the President, and the vision that's set forth by the Service chiefs and by the Joint Chiefs of Staff. Then in different technology areas and basic research, we plan programs to try to achieve the objectives that they say are needed. Typically, there will be a set of programs, each with a very focused objective. But, when you put them all together, your overall objective is to achieve a major change, such as the design and construction of the Stealth aircraft. Although the content of the program changes over time, the strategic objectives change slowly. The overall objective, as I said at the beginning, is always to find military advantage based on technology, so that then we can package it in the systems we buy, and provide it to the warfighter in a way that he or she can use it.

Today, there have been strategic changes in the way we invest in science and technology. Let me highlight three of those. One is that we are focusing on the reduction of cost as the objective of the science and technology program, where in times past the focus was more on improving performance; for example, flying faster, being more stealthy — those kind of objectives. Well, today we want to go a longer time between maintenance of an aircraft engine — and do so safely! We want the cost of a component, for example an artillery round, to be lower so we can afford to buy more of them with less dollars. These are examples of affordability objectives. If

you start early in the science program and technology maturation program, do what is necessary to reduce the eventual costs of systems that are bought, affordability or reduction of costs is an important objective today, where a decade ago it was not a first-rank objective.

Another objective, certainly in Secretary Perry's administration, is to transition technology as rapidly as possible. We have developed a program called Advanced Concept Technology Demonstration where the technologist teams with the warfighter to field for an extended period of time — up to two years — a prototype system or set of systems so that the warfighter can experiment with those systems in field or close-to-field conditions, to see whether it works, and to explore new doctrine or new ways to use that system. We have a number of ACTDs today. One example is an unpiloted air vehicle called the Predator, and it's actually flying in Bosnia today; it is being used for surveillance. It's equipped with sensors, flies over territory, and reports back to its home base. It can autonomously fly itself back to its landing site. And it is a vehicle that gives us long-term surveillance, at a lower cost than a piloted vehicle to do the same job. And, if the commander requires, it can fly into space where you don't want to put a human life at risk.

That's one example of an ACTD that's flying today, in Bosnia. Overall, the ACTDs are an example of technology transition, which as I said, is a strategic objective for the science and technology program.

A third strategic objective is dual use technology. We want to develop technology such that we use commercial technology where we can. And the reason for doing that is the nation as a whole makes a substantive investment through industry, through other agencies' investment, and even through our own, developing technology where the largest market is commercial, not defense. There are economies of scale to be gained if we can buy

commercial components. So, if there are places where we can utilize electronics packaged in plastic as opposed to being packaged in ceramic materials, as many of our Military Specification (MILSPEC) components are, we can buy those components much more cheaply.

Second, we will have the advantage of more modern micro-fabrication than if we have to stick with MILSPEC-packaged electronics, developed on an older fabrication line that just builds defense electronics, and is not modernized to be competitive commercially. And so piggybacking on dual use technology, getting the economies of scale that the commercial market engenders, and getting the benefit of commercial investment in that technology gives us an advantage. So, investing in using dual use technology and piggybacking on it wherever we can in the technology program is another strategic change that's part of the technology program. The program really has changed over the last several years, and I've given you three examples. One is setting affordability as an objective; the second is ensuring more rapid technology transition; and the third is exploiting dual use technology.

**Program Manager:** Is there anything more you'd like to add in this area?

**Jones:** I'd like to highlight one more thing. Starting this year, to make sure that the technology program is serving the future needs that the warfighter sees coming, we have developed a joint warfighting science and technology plan. We started with a dozen needs stated by the Joint Staff. And we've made sure that we have sets of projects in the technology program that are exploring the technology that could meet those needs. Actually, on the April 4, 1996, we're going to present that plan to the Joint Requirements Oversight Council (JROC) for approval. And this is just one of the things that we've done to make sure that the science and technology program is in every way possible serving the needs of the warfighter.

**Program Manager:** The next question has to do with the Technology Area Review and Assessment. How do initiatives like this and the Defense Science and Technology Advisory Groups fit into this strategy?

**Jones:** I've talked to you about the planning process and how we start with the President's science and technology strategy and the joint vision as espoused by General Shalikashvili. I issue a defense science and technology strategy that enunciates strategies like dual use technology, reduced cost, and rapid transition technology. Then we build several plans: the basic research plan, the defense technology plans (one each for a set of 10 technologies), and the Joint Warfighting S&T Plan that I told you we're taking to the JROC. Those build on and interact in a complementary way with the plans that the Services and agencies have for their programs, which they've also documented.

The Technology Review and Assessment (TARA) that you mentioned is a DDR&E initiative in which an outside group of scientists and engineers evaluate the plans for the 10 technology areas and the basic research plan. They advise me. We'll be doing those reviews and assessments in the next two months. For each one we will take a week each with a very small team of people who are, to the greatest extent, drawn from the world outside DoD who are premier scientists and engineers in their own right, to give us their best advice. So it dovetails very nicely with our whole planning and budgeting process.

**Program Manager:** Are you satisfied with the way in which ACTD projects are being handled thus far?

**Jones:** They're an important vehicle for rapidly transitioning technology. I think that they are working very well. We are in early stages in many of them because this was a new initiative under Secretary Perry and Secretary Kaminiski. The first ones are coming to closure. The Predator UAV that I men-



*...advantage based on technology, so that then we can package it in the systems we buy, and provide it to the warfighter in a way that he or she can use it.*

tioned earlier is going to move into low rate production, and I think that is a sign of success of that particular ACTD. I am very positive about them, very supportive of them, and I think they are proving to be a good technology transition vehicle.

**Program Manager:** Do you see any problems in keeping this technology "hot" until it can be transitioned into the acquisition system?

**Jones:** I view the ACTDs actually as an initiative of the technology community because they're being funded with technology funds to more rapidly move them into acquisition. So it's not an issue of keeping the technology

hot, but speeding the warfighter evaluation of that technology. We're doing that by working together with the warfighter in the ACTD and giving that warfighter the opportunity to evaluate technology. So we are speeding it up, not just keeping technology on some burner.

**Program Manager:** How quickly do these become obsolete? Have you seen anything on the drawing board that, by the time it's developed, has been overtaken by something else?

**Jones:** Typically not. One of the hallmarks of the science and technology program is we evaluate fairly rigorously, both from my office and also in the Military Departments and in the agencies, and adapt programs. So if a technology is not panning out or if there is a new development that makes you want to change what you're doing, we just change because we have the freedom to do so in the technology program. The time that I worry about technology being overtaken is actually when it's outside of the technology development process and it's into acquisition, and our acquisition process then takes so long to actually field it. That's where you see ancient technology continuing to be bought because the program managers are constrained by the rules that they operate under and cannot change as readily as one might like them to be able to change.

**Program Manager:** In a comparison of the Predator to a manned vehicle, the savings must be astronomical. Do you have any idea of how much you save every time you put a UAV out versus a manned vehicle?

**Jones:** Each kind of flight craft has a different set of missions, a different set of things it can do and not do. So it's quite difficult to directly and only compare the price tag of two types of aircraft. There is less flexibility in an aircraft when you don't have a pilot.

**Program Manager:** What size is the Predator, as an example?

**Jones:** I think the best metric on that is cost. The Predator costs about \$10 million, whereas an aircraft that has to be fitted out to hold a pilot and crew – a large surveillance aircraft like a JSTARS – is many times that. As I said earlier, two different types of aircraft are not directly and functionally comparable. For example, the JSTARS has on-board analysis. It has capabilities that you don't have on the Predator because of weight limits. The Predator is a very small aircraft in comparison and can only carry a limited payload.

**Program Manager:** Dual use technology and affordability are elements of your business strategy. In your experience, can the Department play a useful role in these areas short of assuming responsibility for some form of centralized industrial planning?

**Jones:** Absolutely. Particularly when we're using technology to reduce the cost of a system. We are for example right now investing in what are called smart structures where you actually embed sensors and activators in structural elements; for example, the main structural beam in a helicopter body, or a structural beam in some ground vehicle. We want the structure to react. We have technology whereby we can embed sensors in metal and composite structures to detect stress, corrosion, and fractures, and actually report out so that you don't do maintenance based on number of hours' use any longer, but based on the actual state of the system. And that could save immense amounts of money. Maintenance is very expensive. If the aircraft skin can report out, "I am corroded over here," then that would be a basis for reducing some of our maintenance costs. And it has nothing to do with centralized industrial planning; it's using technology smartly to reduce the cost: either the cost of the original acquisition or the cost of operation.

**Program Manager:** Models and simulations, information management, and sensors are all examples of technology serving as a force multiplier. Could you elaborate on potential in each of

these areas for meeting future national security needs?

**Jones:** First, information technologies broadly are the basis of what many people are calling today a revolution in military affairs. If you can deliver highly precise information in a timely way, which may be near real-time or real-time, a commander can change the way a battle is fought. Forces can be managed differently, and there are new options for the delivery of firepower to the theater. And so information technology, broadly speaking, is a catalyst for this revolution in the military.

Modeling and simulation is one kind of information technology as are our sensors, an important piece of which is electronics. Information technology broadly runs through the three areas you highlighted.

Models and simulation, I believe, are going to become ubiquitous. Let me give you a thumbnail sketch of what a simulation is. One can model a physical phenomenon or model the behavior of ground forces in a theater, for training purposes. In both cases, what the computer brings to the simulation – computers underlie simulation – is that it keeps track of a whole lot of details that the human mind is not very good at keeping track of. The human mind is very good at seeing patterns in complex situations and making macro decisions about what's happening in a situation. And so if you can team the human mind that sees the complex patterns and can make the decisions with the computer that keeps track of the details and can portray them in a useful way for the human being, then the human being can achieve more.

Whether it's a scientist looking at a very detailed physical molecular model of corrosion inside an aircraft metallic surface, or whether it's a ground commander who is thinking about a particular tactic for the next day's battle, the computer simulation presents a detailed depiction of what

is happening or might happen, and it allows the human being to do what a human being does so well. And that is to get insight – whether it's an engineer looking at a physics model, or a commander who's about to fight a ground battle. Simulation, I believe, is a mind expander. You're going to see it everywhere. Computers have been absorbed into almost all the office and all the warfighting processes and procedures that we have; they just fade into the background. Simulations are going to be absorbed in the same manner. They're going to fade into the background and just be another tool whereby the human being does what the human being wants to do. But the simulation is a support that allows you to do things in a way that without it, the human being cannot do.

**Program Manager:** A detailed response indeed – you certainly are enthusiastic in speaking about this area...

**Jones:** Well, it's very exciting! Technology is changing the way literally everything in the Department of Defense is being done. And the faster we harness this technology in a way that the warfighter can use it, the more advantage we have over adversaries that we might meet out in the future.

**Program Manager:** In the area of basic research, are you satisfied that DoD is adequately financing those areas which will be critical to national security?

**Jones:** Under Secretary Perry's leadership, we have essentially sustained the basic research budget – the budget to do scientific exploration of ideas that won't come to fruition for a decade or two out. And in a budget reduced about 40 percent over the past decade, that is an appropriate level of funding. It's important that we continue to fund that research, the very longest term endeavors, because we must leave that legacy for those who will come after. There is no way to compress the decade-long time that it takes for a wholly new scientific idea

to be developed and eventually captured in systems that we actually hand to the warfighter.

Many people talk about letting industry do it. Industry is very good in a short number of months, e.g., 18 months, to develop a new incremental product that was slightly better than the last product of the same kind that they developed. It's a very different thing to develop a wholly new idea like the laser or like a thermal imager, which is a sensor that can see heat. It takes fielding generation after generation before they really get to be very good. We "owned the night" in Desert Storm because we developed technology that enabled us to "see heat" — which is how you see in the night. That was started two decades ago.

**Program Manager:** Do you see somewhat of a danger in depending on corporate-funded research to a large extent in the Department of Defense?

**Jones:** Industry does very little funding of long-term research. They do a great deal more funding of development than we do. As global competition for market share increases, they increasingly invest in the short term.

One of the elements of our acquisition process is that we have something called IR&D or Internal Research and Development. And it's roughly a percentage of our procurement budget. As our procurement budget has gone down, IR&D has gone down, and that was the money that many of the companies that served Defense used to do research. But that's reduced today. So I'm deeply concerned that industry is not investing in research. In fact, it's investing less than it did, partly because our own IR&D is down, but partly because global competition is driving industry to invest more in the short term and less in the long term. And I think you see that in the reports that industrial research laboratories are becoming smaller or are eliminated.



*When I refer to the sciences and technology. They also provide science and engineering support for acquisition. And they also solve immediate problems, so called in-Service engineering.*

**Program Manager:** What about our DoD laboratories? Do you think they're going to survive, and also will they be funded for the type of research they want to do?

**Jones:** The DoD Laboratories do three things. They do what I'd refer to as science and technology. They also provide science and engineering support for acquisition. And they also solve immediate problems, so called in-Service engineering. The laboratories typically combine all three. Different Services do it in different ways. But those are complementary activities. And I think performing them as complementary activi-

ties is a good thing to do. Our laboratories are downsizing, and they should downsize. It is necessary as the budget is reduced. Our infrastructure ought to go down. Will the laboratories survive? Absolutely. They'll just be smaller. I hope they will be "leaner and meaner"; and where it's appropriate, that we rely more on industry and do more outsourcing. So I think it's entirely appropriate for the laboratories to reduce in size and rely in more creative ways on industry and on the universities, and do so in a smarter way.

**Program Manager:** What would be the impact on national defense, in your opinion, if we were to reduce funding for research drastically?

**Jones:** Catastrophic! I think you wouldn't notice it today. When you say research, it means a very long-term investment. It would not have an effect today. But it would sell short the legacy to those who come after. And I think it would be catastrophic if you reduced it drastically.

**Program Manager:** Which nation do you believe has the best science and technology?

**Jones:** I don't think you look to one nation to be the best in everything, not even the United States. I think we are predominant in a number of areas, for example, in software. I think we are clearly predominant in the world in that particular area. We are clearly predominant in the technologies that underlie Stealth. I think the right way to ask that question is to consider technology area by technology area. And different nations will have a particular edge in different areas.

It is difficult to answer the question in terms of sciences because that is so fundamental you don't know what's going to be important until years later. In technology areas you can look at fielded systems, whether they're commercial or defense, and see that one nation is better than another in particular areas. For example, in this country we do not have a robust flat panel



display industry. There are many areas in which it is a horse race, and the technology ascendancy can move from one nation to another fairly dramatically. That's one reason why it's very important to sustain an investment and not invest heavily in an area one year, drop it dramatically in another year, destroy your infrastructure, invest the next year, and spend that investment building back the infrastructure, whether it's in industry or laboratories or universities. It's important to continue sustained investment.

**Program Manager:** How has the disintegration of the Soviet Union affected our science and technology programs? Have we benefited from that change; have we gained anything from them?

**Jones:** I think it has had a very negative effect on their nations because they cannot fund their scientists and engineers adequately, and we see that to be a problem. For a nation to be stable and strong economically, it must have a cadre of scientists and engineers. It has given us an opportunity in that former Soviet Union countries are willing to work with us in some areas, in where there was no discussion in the past. For example, under the Gore-Chernomyrdin Agreement to do cooperative research and development, Secretary Perry has just signed an agreement to explore the Russian K-36 ejection seat.<sup>1</sup> This is an ejection seat that is a fine example of engineering. It is an ejection seat that we will evaluate. It is one of a number of examples where we have made a cooperative agreement to test prototypes that the Soviets developed.

If you take the long view, both the United States and the former Soviet Union made very large investments in science and technology. Because different people were involved, they made different tradeoffs. So they invested differently. As a result, they may know some things that we don't know. We routinely in a cooperative arrangement like this will evaluate prototypes they built, often over in

Russia, and the data that is gained, which is the product of the cooperative agreement, is available to both. And so we learn something, without having made the same investment. And in some cases, that information may prove to be useful. If so, it will be exceedingly cost effective. Even if it's not useful, for a very small evaluation cost you have learned that an avenue of technology exploration was not fruitful, and it's still a good investment because you learn for a very small cost that a candidate investment was not worth making.

**Program Manager:** You mentioned the flat panel displays. The Japanese dominate that market, and in many other areas too. How do you see that playing against us in the future as we get into a war where we have to depend on them for parts, pieces, and technology to go with the software that we're better at, but takes hardware to support?

**Jones:** We have systematically done an evaluation of different industrial sectors to ask the question whether the United States had the necessary industrial sector to support national security. In most of those areas, the conclusion has been while industry may be changing in that sector, maybe due to the downturn in the defense budget, there was not a need for DoD to intervene in that industrial sector. A counter example is that we evaluated the submarine construction industry and determined that we needed to continue submarine construction capability, even in the face of not needing the next submarine. The conclusion was that the United States had to keep that industrial capability in place.

Under Secretary Perry's leadership, evaluations have been made, and DoD is not investing unless it deems that it is absolutely necessary, and typically it's not. If you have multiple sources off shore, particularly if those sources are in multiple nations, you may deem that it is not a security risk to forego having industry on shore. Increasingly, a particular company is not national — it is international. And it's very difficult to

draw that line of old where "Made in America" was the only acceptable option.

**Program Manager:** You sound optimistic that many of the people who are afraid that we're not manufacturing in this country anymore, that that may not be as big an issue as the newspapers would lead you to believe.

**Jones:** I think we've shown by these disciplined studies that you can take a disciplined, analytic approach and answer the question, but you do it industrial sector by industrial sector.

**Program Manager:** What product of 20th Century science other than the bomb do you think has had the greatest impact on warfare?

**Jones:** I'm a scientist, so let me look out into the future. I think information technology is the catalyst for a revolution in military affairs. I think it will be wide sweeping in its effects. I think we haven't completely mastered those effects. The effect will be, as it often is, not just in the technology itself, but how warfighting doctrine changes, how the warfighters use this information-based revolution that gives you the ability to know precisely not everything, but much of what you want to know. To precisely locate and navigate forces, and to precisely put destructive power where you want it will change warfare every bit as much as the bomb.

**Program Manager:** One last question. What's the best advice you ever received that prepared you for the job you now hold?

**Jones:** When I was a very little girl, I often went fishing with my father — more than I wanted to, because he loved to fish. And the advice he gave me at that time was, "I don't care what you do — but just do something that you like more than fishing." So I did.

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#### END NOTE

A photo of a Russian K-36 ejection seat appears on p. 10 of this issue.



Col. Richard W. Bregard, USA, becomes the Dean of College Administration and Services, Defense Systems Management College (DSMC), effective July 22, 1996. Bregard comes to the College from his assignment as the Project Manager, Tank Main Armament Systems, Armament Materiel Command, Picatinny Arsenal, N.J., a position he has held since June 3, 1993. His DSMC assignment culminates a military career that began in July 1959, when Bregard enlisted in the U.S. Army.



Bregard's military career spans 37 years and includes several key OCONUS and CONUS assignments: Vietnam, Korea, Germany, Redstone Arsenal, Mississippi Army Ammunition Plant, and the Pentagon. He also attended the Industrial College of the Armed Forces and was later assigned as a member of the Research, Development, and Acquisition faculty. Bregard became the 36th Commander of Rock Island Arsenal, followed by his appointment as Deputy Program Executive Officer for Armaments.

Bregard is married to the former Carolyn Brown of Arlington, Va. He has three grown children.

Col. William E. Knight, USA, Dean of College Administration and Services, departs the College July 22 for his new assignment, effective July 31, as Commander, Special Projects Support Activity, Army Materiel Command, Fort Belvoir, Va.



Knight came to DSMC in May 1993 and has served in the capacity of Dean, Division of College Administration and Services, during his entire tenure at the

College. His prior assignment was Chief, Military Acquisition Management Branch, Total Army Personnel Command.

Knight's acquisition experience includes assignments as Program Manager, Office of the Deputy Assistant Secretary of Defense; Deputy Program Manager for Logistics, Defense Mobilization Systems Planning Activity, Office of the Secretary of Defense; and Instructor, U.S. Army Logistics Management College. His other military assignments include command and staff duty in the continental United States and overseas in Germany and Korea.

Knight and his wife Susanne are parents of two sons: Brian and Shawn.

Col. John Mahony, USA, became the Executive Officer to the Commandant, DSMC, effective March 28, 1996. A 1978 graduate of the United States Military Academy, he was commissioned as an infantry officer and served in the 101st Airborne Division, VII Corps G-3, and 1st Infantry Division (Forward).



Following his command assignments, he received an M.S. in Space Systems Technology from the Naval Postgraduate School. His acquisition assignments include: Force Modernization and New Equipment Fielding for VII Corps (1982-83); the Army Space Program Office (1988-91); and the Ballistic Missile Defense Organization (1992-96). He is a graduate of the Armor Officer Advanced Course, Command and General Staff College, and the Defense Systems Management College Program Management Course 93-1.

Mahony is married to the former Georgia Nolan and has two daughters: Lara (17) and Kristin (14).

# How to Use Foreign Comparative Testing (FCT) in Your Program

## Identifying and Procuring World-class Foreign Equipment — Now!

MAJ. STAN L. VANDERWERF, USAF

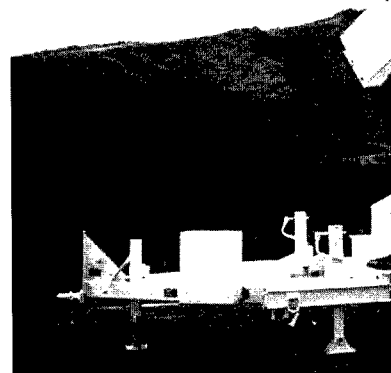
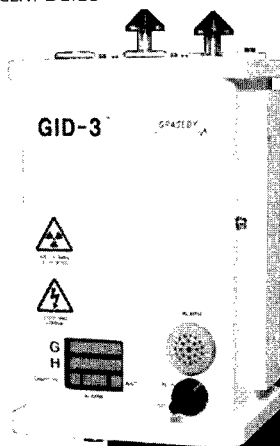
**T**oday's downsizing environment is a scary proposition for Department of Defense (DoD) program managers as competition for scarce Research, Development, Test and Evaluation (RDT&E) and production dollars intensifies. This article describes how you, a program manager, will find the Foreign Comparative Testing (FCT) Program a surprising tool for your "management toolbox."

Tried and proven, FCT is a cost-effective method of providing equipment to the warfighter. Also, FCT provides you with Office of the Secretary of Defense (OSD) funds to test and evaluate foreign nondevelopmental equipment to meet Service or Commander in Chief (CINC) mission requirements. The good news is those funds are not subject to "fiscal raids" within your own Service. Of course there are more FCT proposals than funding, so you must compete for the dollars.

### What is the FCT Program?

While FCT was authorized by Congress in 1989, its predecessors, the Foreign Weapons Evaluation and North Atlantic Treaty Organization (NATO) Comparative Testing (NCT) programs existed for many years. The

AN EXAMPLE OF A NUCLEAR, BIOLOGICAL, CHEMICAL AGENT DETECTOR ALARM, DEVELOPED BY THE BRITISH AND SUBSEQUENTLY PURCHASED BY THE U.S. ARMY FOR ITS NBC RECONNAISSANCE VEHICLES, IS THE BRITISH GID-3 AUTOMATIC CHEMICAL AGENT DETECTOR ALARM (ACADA). Photo courtesy Graseby Dynamics Ltd.



K-36 RUSSIAN EJECTION SEAT. TECHNOLOGY FROM THE RUSSIAN K-36 EJECTION SEAT IS BEING ASSESSED FOR APPLICATION INTO THE FOURTH GENERATION EJECTION SEAT AND IS STRONGLY SUPPORTED BY THE USAF FOR POSSIBLE INSERTION INTO THE JOINT ADVANCED STRIKE TECHNOLOGY (JAST) PROGRAM.

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*VanderWerf is the U.S. Air Force Program Manager for the Foreign Comparative Test (FCT) Program and works for the Secretary of the Air Force, specializing in international cooperative acquisition. He is a graduate of PMC 95-2. He gratefully acknowledges the editing assistance of the Department of Defense Service-wide FCT team.*

FCT Program is administered by the Director, Test Systems Engineering and Evaluation, Office of the Under Secretary of Defense (Acquisition and Technology). It fits well with the latest DoD trends toward using commercial and Nondevelopmental Items (NDI).

The FCT Program tests and evaluates foreign NDI developed by U.S. allies

and other friendly nations to determine whether the equipment can satisfy CINC and Service requirements or correct mission area shortcomings. Many foreign NDI items offer cost-effective alternatives to new, and perhaps unnecessary, U.S. developmental efforts and can reduce the time to field equipment needed by the warfighter. By identifying foreign alternatives, FCT stimulates competition from U.S. manufacturers. However, safeguards are in

place to ensure that U.S. manufacturers are not placed at any disadvantage and that U.S. industrial base issues are considered.

The FCT Program also delivers the benefits found in purchasing NDI. A Defense Systems Management College (DSMC) report, *NDI Acquisition: An Alternative to "Business as Usual,"*<sup>1</sup> clarifies what constitutes an NDI purchase. It describes Congress's definition of NDI as:

- any item available in the commercial marketplace;

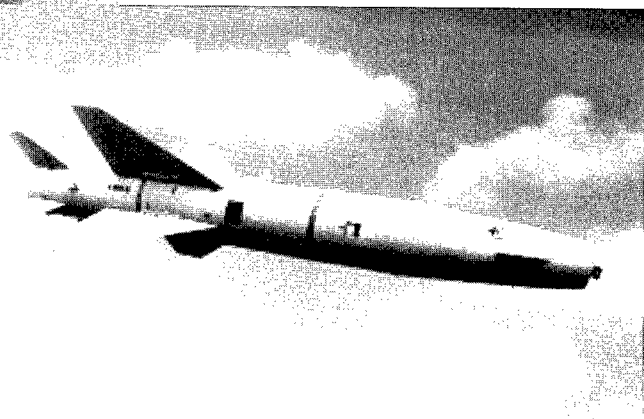
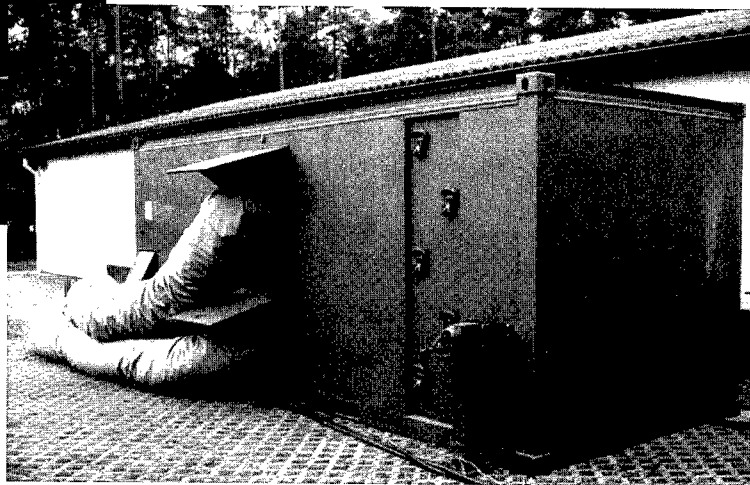
**Many foreign NDI items offer cost-effective alternatives to new, and perhaps unnecessary, U.S. developmental efforts and can reduce the time to field equipment needed by the warfighter.**

- any previously developed item in use by the U.S. Government or cooperating foreign governments; or
- any item of supply needing only minor modifications to meet DoD requirements.

### **DoD Benefits from the FCT Program**

Are there ways you, a DoD program manager, can benefit from the FCT Program? As you know, acquisition benefits come in three flavors. You've

EAGLE VISION SHELTER AND SATELLITE DOWNLINK GROUND STATION. EAGLE VISION IS A FRENCH TRANSPORTABLE SPOT IMAGERY RECEIVING STATION THAT ELECTRONICALLY PROCESSES THE SPOT IMAGERY FOR USAF USE. THIS SYSTEM IS NOW SUPPORTING BOSNIA OPERATIONS AND HAS THE SUPPORT OF THE AIR FORCE CHIEF OF STAFF. Photos courtesy Environmental Research Institute of Michigan, Matra Cap Systemes, and Datron/Transco Inc.



ISRAELI HAVE NAP (AGM-142) MISSILE. THE USAF HAVE NAP MISSILE ALONE WOULD HAVE COST ABOUT \$160 MILLION TO DEVELOP DOMESTICALLY. FOR THE COST OF \$10 MILLION IN FCT FUNDS, HAVE NAP WAS QUALIFIED AND PROCURED FOR USAF USE. HAVE NAP, ALSO KNOWN AS THE AGM-142, IS STILL IN THE USAF'S INVENTORY TODAY.

Photo courtesy of Rafael

heard them before — cost, schedule, and performance. The FCT Program helps meet Service mission requirements and accelerates fielding of equipment to the warfighter. Over the life of the Program, FCT has:

- resulted in over \$3.4 billion in Service procurements of foreign equipment with \$425 million FCT funds expended to conduct all tests (a ratio of 7:1);
- saved hundreds of millions in proven RDT&E cost avoidance;
- leveraged RDT&E dollars invested by other countries;
- stimulated competition and alternate sources of equipment;
- helped promote two-way weapons cooperation and sales with our allies; and
- created teaming arrangements between foreign and U.S. vendors thereby stimulating domestic economic benefits and jobs.

In fact, many products tested under the FCT Program end up being produced in whole or in part by U.S. contractors. The sometimes voiced complaint that FCT moves employment overseas just doesn't hold water.

## Success Stories

Proof is in the pudding, and FCT has pudding to prove. Figure 1 depicts a sample of Service procurements that resulted from locating world-class foreign products. The U.S. Air Force (USAF) Have Nap missile alone would have cost about \$160 million to develop domestically. For the cost of \$10 million in FCT funds, Have Nap was qualified and procured for USAF use. Have Nap, also known as the AGM-142, is still in the USAF's inventory today.

Some FCT success stories cannot be correctly described in dollar amounts. For example, the French commercial Spot satellite broad-area imagery evaluated under FCT was used by the USAF during Desert Storm to map Iraqi terrain for use in our mission planning system. The imagery was unclassified (releasable

Figure 1. **Service Procurements Resulting from Locating World-class Foreign Products**

Service	Product Name	Procurement Cost (\$M)	Number
Army	105MM Lightweight Howitzers	362.0	427
Navy	Penguin Missiles	251.0	101
Air Force	Have Nap Missiles (AGM-142)	203.0	160
Army	Improved 81MM Mortar Round	342.8	2,250,000
Navy	Infrared Imaging Systems	138.6	53
Air Force	Durandal Runway Attack Weapon	241.0	6,900
Army	NBC Reconnaissance Vehicles	180.8	113
Marine Corps	Night Attack Avionics Systems	126.0	1,112
Air Force	Aircrew Chemical Defense Suits	42.3	97,200

to our coalition partners), available, and inexpensive. The follow-on FCT effort, Eagle Vision, is a French transportable Spot imagery receiving station that electronically processes the Spot imagery for USAF use. This system is now supporting Bosnia operations and has the support of the Air Force Chief of Staff.

The FCT Program capitalizes on the benefits found in purchasing NDI items. In the DSMC report, *NDI Acquisition: An Alternative to "Business as Usual,"*<sup>2</sup> NDI acquisitions provide many benefits to program managers. "Benefits include:

- quick response to operator needs;
- elimination or reduction of research and development costs;
- application of state-of-the-art technology to current requirements; and
- reduction of technology, cost, and schedule risks."

Please keep this in mind. Using the FCT Program can reduce technology, cost, and schedule risks.

If meeting a mission need is too costly with a domestic development, it might be affordable using a foreign product, even if that product is not the 100-percent solution. Remember, cost is now regarded within DoD as an independent variable, which could mean a mission need won't be met until a

solution can be found below a certain cost threshold.

## Risks

Certainly FCT projects do not come without management risks. However, FCT projects are scrutinized at higher levels within your Service and OSD. This scrutiny may at first seem a detriment, but once you satisfy the program criteria and obtain OSD funding approval for the project, you can use that approval to your advantage by:

- showing the foreign vendor OSD support;
- knowing the funds you receive from OSD will not be taken by Service financial raids; and
- having the confidence your program is specifically approved by Congress.

The DSMC report on NDI<sup>3</sup> described additional FCT challenges as:

- mission performance trade-offs being required to gain advantages from pursuing NDI alternatives;
- logistics support;
- product modifications; and
- concern over continued product availability.

## Legal Language For the Hard Core Types

What legal requirements must you cover to have an FCT Project? By

law, FCT is a Title 10 program (10 U.S.C. 2325) and has its own specific legal obligations. Subpart 206.302-1(b) of the Defense Federal Acquisition Regulation Supplement (DFARS) permits contracting officers to use the authority of Subpart 6.302-1 of the Federal Acquisition Regulation (FAR) to buy test articles and associated test support services from foreign sources for the FCT program. A standard Justification and Authorization (J&A), as provided in Subparts 6.303 and 6.304, should be used. Your Service may have a class J&A ready for your contracting officer's use to assist in procuring foreign test articles.

In addition, FCT supports standardization objectives outlined in 10 U.S.C. 2457(b), thus helping your program meet additional requirements. Finally, your Milestone Decision Authority (MDA) must consider the identification of cooperative opportunities as required by 10 U.S.C. 2350a(e). If a cooperative opportunity is located, FCT could be your tool to obtain the product for test and evaluation.

Approval for an FCT project comes from Congress (FCT test notifications 10 U.S.C. 2350a(g); and annual reports to Congress, submitted by OSD with your inputs, are required (10 U.S.C. 2457d.). Further, U.S. law (10 U.S.C. 140) requires market research and analysis to determine all possible products, foreign and domestic, if FCT is being considered for your program. Worried about the Buy American Act? The DFARS, Subpart 225.872, waives the Buy American Act for NATO and other qualifying countries when using the FCT Program. (Refer to the DFAR, Subpart 225.)

The Federal Acquisition Streamlining Act (FASA) also has provisions for NDI. It changes FAR Part 6 (6.202 and 6.502), Sections 1002 (for 10 U.S.C.) and 1052 (for 41 U.S.C.), to establish or maintain alternative sources to ensure reliable sources of supply. Of course, FASA has many new provisions for using commercial products,

and many FCT products fall within these guidelines.

Because the FCT Program is designed to procure foreign NDI products, procedures for purchasing NDI equipment generally apply. *Buying NDI*, a Production and Logistics Guide published by the Office of the Assistant Secretary of Defense; the NDI Preference Act of 1987; and the Packard Commission of June 1986 all prescribe lesser reliance on military specifications and a greater use of "off-the-shelf" components. As expected, when selecting NDI, life-cycle cost, effectiveness, and suitability criteria should be used. Also, NDI should be considered for sub-component level, and the FCT program fully supports this concept.

Today personnel in acquisition should remain continuously cognizant of international expertise and products in their specialty. The documents mentioned in the preceding paragraph describe source selection, solicitation, market analysis, testing, warranties, data rights, product assurance, logistics considerations, preparation and use of commercial item descriptions, and logistics tailoring support for NDI.

In the new draft 5000.1 series documentation, the FCT Program is described as a tool to help program managers assess international cooperative opportunities and, as such, should be part of your institutional approach for acquisition. Section 2.3.1 of the draft 5000.1 document tells us to consider system performance in the commercial and foreign weapon sector to assist in the development of the Operational Requirements Document (ORD) or Mission Needs Statement (MNS). The document also tells the program manager to require that prime contractors and subcontractors incorporate NDI where it's cost effective. These items "shall be based on widely used and commercially supported specifications and standards to the maximum extent practicable."

The current DoD 5000.1 document also supports FCT. It establishes a pri-

ority for acquisition program material alternatives. First priority is to use or modify an existing U.S. military system. Second is to use or modify an existing commercially developed or allied NDI system (FCT supports this priority). These take precedence over an international cooperative R&D project, a joint Service program, and Service-unique developmental programs. The draft 5000.1 also calls for setting program cost objectives. If a requirement solution exceeds a pre-determined cost threshold, less expensive

## **Worried about the Buy American Act? The DFARS, Subpart 225.872, waives the Buy American Act for NATO and other qualifying countries when using the FCT Program.**

alternatives must be selected. Program managers should keep the FCT Program in mind as a means to support DoD 5000.1 objectives.

### **How to Submit an FCT Proposal**

A Candidate Nomination Proposal (CNP) format is used to focus preparers on the information required by OSD. Currently, OSD's *Foreign Comparative Testing (FCT) Program Procedures Manual*<sup>4</sup> is being rewritten to provide amplifying guidance. Examples of CNPs (electronic copy and paper), the Procedures Manual, and other documentation can be provided

## Figure 2. FCT Program Points of Contact

### ARMY

Mr. Bloom, ICPA

Comm: 410-278-1368

DSN: 298-1368

E-Mail: rbloom@apg-9.apg.army.mil

### NAVY

Mr. Milligan, IPO O3C4

Comm: 703-604-4967

DSN: 664-4967

E-Mail: jmilligan@san.idss.iad.org

### AIR FORCE

Maj. VanderWerf, SAF/IAQ

Comm: 703-607-3153

DSN: 327-3153

E-Mail: stan.vanderwerf@saf-ia.hq.af.mil

### MARINES

Mr. Palmer, MARCORSYSCOM PSL-ICP

Comm: 703-784-5871

DSN: 278-5871

E-Mail: palmerc@mqg-smtp3.usmc.mil

### USSOCOM

Mr. Nelson, SOAC-SP

Comm: 813-840-5264

DSN: 299-5264

E-Mail: nelsonrg@hqsocom.af.mil

### OSD

Col. Catts, OUSD(A&T)T&E

Comm: 703-578-8222

DSN: None

E-Mail: cattsrq@acq.osd.mil

by the Service focal points for the FCT Program.

Each year, the Services and the U.S. Special Operations Command (USSOCCOM) nominate FCT projects to OSD for consideration. Each CNP is screened to determine:

- if the item meets DoD's NDI definition;
- if there is a valid requirement;
- whether a thorough market investigation was conducted;
- whether a viable acquisition strategy exists (e.g., the Service intends to procure or insert into an existing project if the equipment meets enough requirements);
- what potential benefits exist;

- the level of user advocacy;
- determination of adequate test procedures and plans; and
- any special contracting considerations.

A list of FCT projects is submitted initially in the President's budget. Later in the year, summary data on each project are formally nominated to Congress. If no congressional questions are asked after a "30-day Congressional Notification Period," the projects are then considered congressionally approved and are ready to receive funding at the beginning of the new fiscal year. Generally, projects are one or two years in length. After receipt of funding, quarterly progress reports, a test report, disposition report, and other sundry requests for information will be required.

### Acquisition Strategy

The most successful acquisition strategies for FCT follow two general test categories: comparative and qualitative. A third category called technical assessment exists but is the lowest priority and has a lower probability of receiving funding since there is no intent to procure. Under a comparative approach, more than one product exists to potentially meet the requirement, and at least one must be foreign. A qualification typically means only one possible product exists to meet the requirement, and it is a foreign product. The following three examples provide derivatives of actual cases where an FCT project led to a procurement. Procurement funding is provided by the Services.

- While in pre-Milestone I, you submit a *Commerce Business Daily* announcement requesting NDI products to meet the user's requirement. One U.S. and one foreign company respond. You test and evaluate these products (testing of the U.S. item cannot be funded under FCT, but the cost of testing the foreign item is) and determine at least one meets your needs. At your Milestone I review, you recommend the Milestone Decision Authority

permit your program to proceed directly to Milestone III since an NDI item meeting the requirement has been found. You place a competitive bid for production, save 18 months in the program, and return a percentage of your R&D funding to the program element monitor to satisfy other Service requirements.

- You are Chief of Supply for a major Service laboratory, and a requirement exists for a specialized electron microscope capability. Only one foreign company makes this equipment. You have a qualification strategy and use FCT funding to contract for the lease of the test unit. You also place an option on the contract for purchase of the test unit and purchase of two additional units (your requirement is only for three items). The item meets your requirements and you exercise the option. Ultimately, FCT was a great benefit because you had Operations and Maintenance money to buy the units but no RDT&E funds to test the items. The FCT Program provided those funds.
- You have a single domestic supplier for an older product still in use in your inventory. Since the item was sold extensively overseas through Foreign Military Sales, you find a foreign supplier as a possible second source, but you question the foreign supplier's ability to meet your needs. After approval and testing under FCT, you determine the foreign-produced item meets the requirement, and you publish a Request for Proposal for supplies of this item. The domestic and foreign companies bid and compete. The U.S. company wins, but because of the competition, you now get U.S.-produced items at a 20-percent savings. Another possibility is to contract with both companies using a task-order approach.

### New and Future Potential Programs

To illustrate some new areas which stand to benefit from the FCT Program, let me offer the following list of ongoing and proposed projects:

**Light Defender**, an Israeli product, is the No. 1 FCT priority for the USAF because it addresses a critical mission need to preemptively destroy enemy air defenses.

A **Micro Satellite bus** from the United Kingdom, which provides a payload mount and power distribution for small space experimentation is proposed for FY97 funding.

The **Modular RECCE Pod** is an inexpensive Danish pod in pre-production specifically designed for use on F-16s.

Technology from the **Russian K-36 Ejection Seat** is being assessed for application into the fourth generation ejection seat and is strongly supported by the USAF for possible insertion into the Joint Advanced Strike Technology (JAST) Program.

The supplier for Milstar Traveling Wave Tubes for ground stations was bought by another company that

closed the production line, forcing the Milstar Program to request an FCT test for a new French supplier.

Finally, the French Renaissance View Satellite Imagery Project is testing several foreign commercial radar imagery products for insertion into the Air Force's Mission Planning System. It will allow the USAF to use inexpensive, all-weather broad area imagery for coalition warfighting mission planning.

### Who to Contact

Are you convinced yet that the FCT can help your program? If you have a project idea or any questions regarding FCT, please first contact your Service representative. Also, if necessary, feel free to request information from any of the contacts shown in Figure 2.

### Summary

The FCT Program is exactly the program we need today with current budget constraints because it identifies for

procurement world-class foreign equipment, which has been developed by another country.

The FCT Program allows the Services to leverage the RDT&E investments of our allies and other friendly nations to satisfy our own needs at a reduced cost and accelerated program schedule. If you are a program manager, you should look into this program. At least be aware it is an option worth consideration, and a possible avenue to meet a mission need, save your program money, avert a schedule slippage, or perhaps even save your program altogether.

### END NOTES

1. NDI Acquisition: An Alternative to "Business as Usual," DSMC 1991-2, Military Research Fellows Report.
2. Ibid.
3. Ibid.
4. Foreign Comparative Testing (FCT) Program Procedures Manual, DoD 5000.3-M-2 (OSD, January 1994).

## About Your Subscription...

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FT BELVOIR VA 22060-5565

Commercial: (703)805-3056  
DSN: 655-3056  
Internet: simpsonc@dsmc.dsm.mil

On behalf of the DSMC Visual Arts and Press, many thanks for your continued readership and support.

— Collie Johnson  
Managing Editor

# Defense Acquisition Policy — A More Flexible Management Approach

## An Insider's Review of the Major Policy and Procedures Revisions to the New 5000 Series Documents

CHARLES B. COCHRANE

**D**efense systems acquisition policies and procedures are provided in DoD Directive 5000.1, *Defense Acquisition*, and DoD Regulation 5000.2-R, *Mandatory Procedures for Major Defense Acquisition Programs (MDAP) and Major Automated Information System (MAIS) Acquisition Programs*. Issued on March 15, 1996, these two documents replaced the former 5000 series last issued in February 1991, with Change 1 in early 1993. As structured, these documents are a major departure in purpose, format, content, and scope from their predecessors. In general they provide less detailed guidance than the previous versions. This article summarizes their major features.

### 5000 Series — From 1991 to 1996

The DoDD 5000.1 provides guiding principles for all defense acquisition programs, from bayonets to satellites. Likewise, DoD 5000.2-R specifies mandatory policies and procedures for Major Defense Acquisition Programs, Major Automated Information System acquisition programs, and a few selected mandatory procedures for

Figure 1. 5000 Series - 1996 vs. 1991

1991	1996
3 documents: DoDD 5000.1, DoDI 5000.2, & DoD 5000.2-M (almost 900 pages)	2 documents: DoDD 5000.1 & DoD 5000.2-R (about 140 pages), with automated deskbook
Hard to distinguish mandatory from discretionary guidelines; discouraged tailoring	Separates mandatory (5000.1 and 5000.2-R) from discretionary; promotes tailoring
Applied to major and non-major defense acquisition programs; did not apply to Automated Information Systems	Applies to major defense acquisition programs & major automated information systems acquisition programs
Mandatory formats for 21 major documents & 7 major annexes to Integrated Program Summary	Mandatory formats for Acquisition Program Base line, Operational Requirements Document, Test and Evaluation Master Plan, Defense Acquisition Executive Summary, Selected Acquisition Report, & Major Automated Information Systems Quarterly Report
50 figures/charts & 36 pages of tables for documents, reports, and certifications	1 figure (Integrated Test Program Schedule); no other charts or tables
Stand-alone milestone documents; many with same information	Information may be combined into a single document for milestone reviews
Oversight & Review along 6-month timeline prior to milestone	Oversight & Review based on continuous Integrated Product and Process Development/ Integrated Product Team approach
Five phases & five major milestones; appeared to be a lock-step process	Four phases & four major milestones; requires tailoring; no one size fits all

non-major defense acquisition programs. A Defense Acquisition Deskbook<sup>1</sup> has been established as an automated system to provide information that program offices can turn to for assistance in implementing both DoDD 5000.1 and DoD 5000.2-R. Figure 1 shows the most significant dif-

ferences between these new/revised 1996 versions and the previous 1991 editions.

### Phases and Milestones.

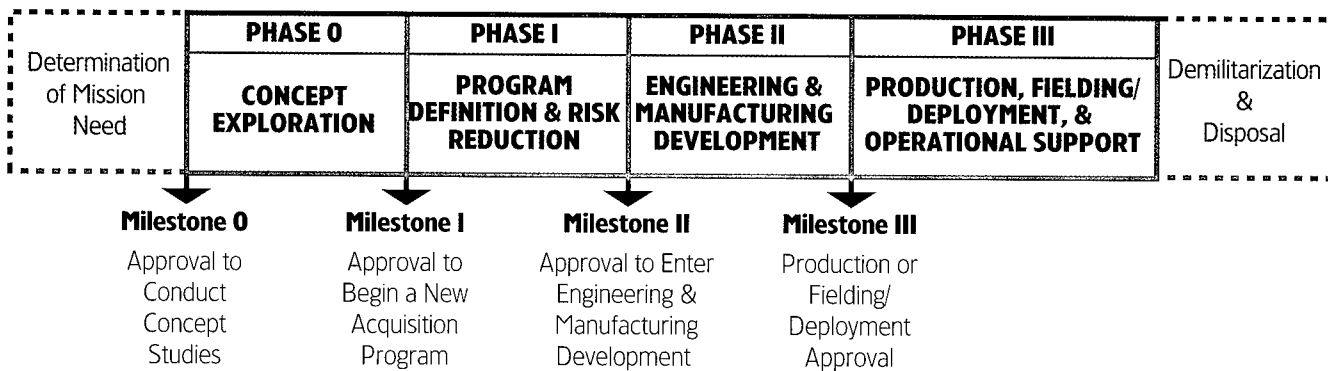
The revised 5000 series still provides a general model with milestones and phases (see Figure 2), but with funda-

*Cochrane is the Faculty Department Chair, Acquisition Policy Department, Faculty Division, DSMC.*

**Author's Note:** In early 1991 my article in the *Program Manager* Magazine summarized what was then a major revision to the "5000 series" policy and procedures, "A Disciplined Management Approach." This article is intended to be a similar review of the 1996 version of the 5000 series documents.



Figure 2. **Defense Acquisition Phases and Milestones**



mental mandatory guidance to tailor this model to fit each acquisition program, consistent with technical risk, design maturity, and sound business practices. The goal is to provide the warfighter with solutions for valid mission needs in the shortest possible time.

Milestone I is still the decision point for initiation of a new defense acquisition program. The name of Phase I has changed from Demonstration and Validation to Program Definition and Risk Reduction. This change provides focus on the key activities of the phase. In 1991, Phase III was divided into two

phases: Production and Deployment, Major Defense Acquisition Programs, and Operations and Support. Combining these phases simply recognizes that support for new systems must start immediately upon fielding.

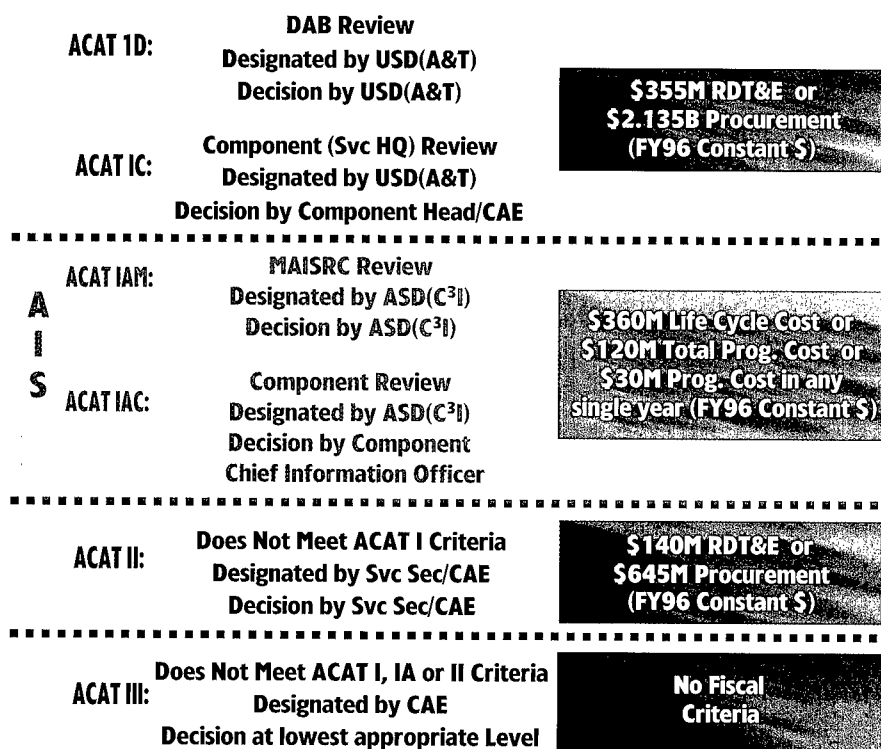
The 1991 policy recognized that a Low Rate Initial Production milestone could occur prior to Milestone III for some programs. This has not changed; however, for Major Defense Acquisition Programs, now only one production decision will be conducted at the Defense Acquisition Board level: low-rate or full-rate. The program manager tailors activities during each phase to

reduce cost, schedule, and performance risk, and deliver a weapon system to meet the warfighter's requirement. The new DoD 5000.2-R also recognizes that there are demilitarization or disposal requirements at the end of a system's useful life.

### Acquisition Categories (ACAT)

Figure 3 depicts the criteria by which defense acquisition programs are categorized. All ACAT designations indicate the level of the Milestone Decision Authority. The Under Secretary of Defense (Acquisition & Technology), as the Defense Acquisition Executive; the Assistant Secretary of Defense (Command, Control, Communications & Intelligence [C<sup>3</sup>I]), as the DoD Chief Information Officer; Component Acquisition Executives;<sup>2</sup> Component Chief Information Officers; Program Executive Officers; and commanders of acquisition commands, are Milestone Decision Authorities.

Figure 3. **Acquisition Categories**



A new category, ACAT IA programs, are Major Automated Information System that require a milestone review by the Major Automated Information Systems Review Council (ACAT IAM), or by the Component Acquisition Executive. Non-major defense acquisition programs are classified as ACATs II and III. The ACAT IV category has been eliminated. Policies and procedures for ACAT II<sup>3</sup> and III programs are determined by the Milestone Decision Authority, if not already specified by the Component Acquisition Executive.

## **Streamlined Chain of Authority And Accountability**

The programmatic chain of authority and accountability for ACAT I and ACAT IA programs extends from the Component Acquisition Executive, through a Program Executive Officer to the individual program managers. Program managers may report directly to the Component Acquisition Executive, without being assigned to a Program Executive Officer, if the Component Head determines such a special reporting relationship is necessary. All matters pertaining to cost, schedule, and performance should flow through this streamlined chain. For ACAT ID and IA programs, there can only be two levels of review between the Under Secretary of Defense (Acquisition & Technology) or the Assistant Secretary of Defense (Command, Control, Communications & Intelligence [C<sup>3</sup>I]), normally the Program Executive Officer and Component Acquisition Executive.

A similar streamlined structure must be established by Components for managing ACAT IC, IAC, II, and III programs. The Component Acquisition Executives also have the option to place ACAT II and III programs under the Program Executive Officer structure. Regardless of ACAT, no more than two levels of review may exist between program managers and their Milestone Decision Authority.

## **DoD Integrated Management Framework**

Policies in the new DoDD 5000.1 continue to forge an interface between the Requirements Generation System; the Acquisition Management System; and the Planning, Programming and Budgeting System. These three major decision support systems must interface effectively for the systems management process to work.

## **Management Principles Applicable to All Programs**

The DoD Directive 5000.1 provides policies and principles that apply to all

defense acquisition programs. Divided into three major categories, the following paragraphs summarize each category and its components:

### **Translating Operational Needs Into Stable, Affordable Programs**

- Integrated Product and Process Development
- Program Stability
- Risk Assessment and Management
- Total Systems Approach
- Cost as an Independent Variable (CAIV)
- Program Objectives and Thresholds
- Non-traditional Acquisitions
- Performance Specifications

### **Acquiring Quality Products**

- Event-oriented Management
- Hierarchy of Materiel Alternatives
- Continuous Communications with the User
- Competition
- Test and Evaluation
- Modeling and Simulation
- Independent Staff Assessments
- Innovative Practices
- Continuous Improvements
- Legality of Weapons Under International Law
- Software Intensive Systems
- Environmental Management

### **Organizing for Efficiency and Effectiveness**

- Streamlined Organizations
- Acquisition Corps
- Teamwork
- Limited Reporting Requirements
- Automated Acquisition Information
- Management Control

## **Mandatory Procedures for ACAT I and ACAT IA Programs**

The DoD 5000.2-R provides detailed procedures necessary to implement the policies of DoDD 5000.1 as they pertain to ACAT I and IA programs, and serves as a general model for other ACATs. It also provides detailed procedures for each of the following Acquisition Management Areas (the procedures for each of these areas may be tailored by Milestone Decision Authorities, consistent with statutory requirements):

- **Part 1**, Acquisition Management Process
- **Part 2**, Program Definition
- **Part 3**, Program Structure
- **Part 4**, Program Design
- **Part 5**, Program Assessments and Decision Reviews
- **Part 6**, Periodic Reporting

The DoD 5000.2-R also has six appendices. These appendices provide procedures and mandatory formats for the Acquisition Program Baseline, Test and Evaluation Master Plan, Operational Requirements Document, Live Fire Test and Evaluation Reports, Major Automated Information Systems Quarterly Report, Cost/Schedule Control Systems Criteria, and a Glossary.<sup>4</sup> Appendix 1 refers to the Consolidated Acquisition Reporting Systems for generating the Acquisition Program Baseline, Defense Acquisition Executive Summary, Unit Cost Reporting, and the Selected Acquisition Report.

## **The User's Requirement**

The DoD 5000.2-R continues to provide for the two basic requirements documents: a Mission Need Statement due at Milestone 0, and an Operational Requirements Document prepared during Phase 0 and due at Milestone I. However, the format for the Mission Need Statement is no longer in the 5000 series, and should appear in the next revision of the Chairman, Joint Chiefs of Staff Memorandum of Policy No. 77.

A Mission Need Statement is required for all potential materiel acquisition programs. Chiefs of the Military Services, Heads of Defense Agencies, and Commanders in Chief of Unified Commands validate and approve their own Mission Need Statements for potential ACAT II and III programs. The Joint Requirements Oversight Council, chaired by the Vice Chairman of the Joint Chiefs of Staff, is the Mission Need Statement validation and approval authority for potential ACAT I programs. For ACAT IA programs, the Office of the Secretary of Defense Principal Staff Assistant<sup>5</sup> or the Joint

Requirements Oversight Council may be the validation authority

The Operational Requirements Document is usually validated and approved by the same operational validation authority that reviewed the Mission Need Statement. However, the Joint Requirements Oversight Council normally delegates Operational Requirements Document validation and approval for ACAT I and IA programs to the Service Chiefs. Normally, Operational Requirements Documents are first submitted to the operational validation authority at Milestone I, and updated for each subsequent milestone. The Operational Requirements Document is used to update the program baseline and develop performance specifications for the contract during each acquisition phase. All Operational Requirements Document key performance parameters are validated by the operational validation authority and included in the Acquisition Program Baseline starting at Milestone I. The mandatory format for the Operational Requirements Document has not changed significantly from the previous 5000 series.

### Acquisition Strategy Approval.

The initial acquisition strategy for the program is developed during the Concept Exploration phase, approved by the Milestone Decision Authority at Milestone I, and updated for subsequent milestones. The acquisition strategy, prepared by the program manager and approved by the Milestone Decision Authority, includes the critical events that govern the management of the program. An acquisition

strategy is also a "core management issue" (discussed later) applicable to all programs. The DoD 5000.2-R specifies the content of an acquisition strategy for ACAT I and IA programs.

### Acquisition Strategy Elements (DoD 5000.2-R)

- Prospective Sources of Supplies and Services
- Contracting Approach
- Management Approach
- Cost, Schedule, and Performance Risk Management
- CAIV Objectives
- Environmental, Safety, and Health Considerations
- Source of Support
- Warranties

There is no standard format for the acquisition strategy. Each program manager will address the acquisition strategy elements in a document of their own design. The release of the formal Request for Proposal for ACAT I and IA programs is linked to the approval of the acquisition strategy starting at Milestone I. For Milestones II and III, the program manager may forward the acquisition strategy to the Milestone Decision Authority for review in advance of the milestone, so that the Request for Proposal can be released, and source selection and/or negotiations completed prior to the milestone.

### Request for Proposal Release

- **Milestone 0:** No restrictions.
- **Milestone I:** Program Definition and Risk Reduction Phase Request for Proposal may not be released until after Milestone I decision.

- **Milestones II and III:** Engineering and Manufacturing Development and Production Requests for Proposal may not be released until after approval of the acquisition strategy.

### Program Review and Oversight

The executive summary signed by the Under Secretary of Defense (Acquisition and Technology); the Assistant Secretary of Defense (Acquisition and Technology); the Assistant Secretary of Defense (Command, Control, Communications & Intelligence [C<sup>3</sup>I]); and Director, Operational Test and Evaluation, that accompanies DoDD 5000.1 and DoD 5000.2-R provides *core management issues that must be addressed at appropriate milestones for every acquisition program.*

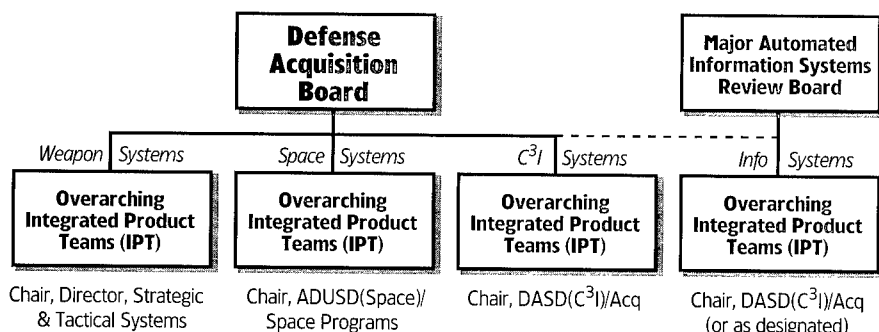
### Core Management Issues

- Why is the program needed?
- Has the need been validated?
- What specific capabilities are necessary?
- When do the specific capabilities need to be introduced to the field or fleet?
- How much will the program cost?
- Is the program affordable and fully funded?
- Have alternative solutions been reviewed, and why was this solution selected?
- What is the acquisition strategy to develop and/or produce the needed capability?
- Has the program's risk been assessed?
- Has a program baseline been developed?
- Is the system or item producible?
- Can it be supported?
- Has the stability of the design and the operational capability of the system been verified?
- Has the system been determined to be operationally effective and suitable?

### The Milestone Review Process

Programs are subject to review by the Milestone Decision Authority's staff prior to a milestone decision. Each ACAT ID and IA program is monitored by an Overarching Integrated

Figure 4. **Overarching Integrated Product Teams (OIPT)**



Product Team (Figure 4) that reviews the status of each assigned program periodically throughout the life cycle, and conducts a formal meeting prior to a Defense Acquisition Board or Major Automated Information Systems Review Council review. An Overarching Integrated Product Team for Defense Acquisition Board and Major Automated Information Systems Review Council programs will be established as soon as it is determined that a new program is to be initiated.

The Overarching Integrated Product Team will determine the extent of Working Level Integrated Product Team support required for the potential program, the appropriate milestone for program initiation, and the information needed for the next milestone review. The Components determine the extent of Integrated Product Team support required to facilitate non-Defense Acquisition Board and non-Major Automated Information Systems Review Council acquisition programs (ACATs IC, IAC, II, and III) through each milestone.

### **Preparing for a Milestone Review**

The steps a program passes through at each milestone are major events in a program's life cycle. Typical milestones and phases were previously shown in Figure 2. The ACAT of the program determines the level of the Milestone Decision Authority, and each Milestone Decision Authority establishes appropriate procedures for ensuring programs are ready to proceed past each major milestone. Figure 5 is an abbreviated illustration of this process for each acquisition category.

For ACAT ID and IAM programs, the Overarching Integrated Product Team will meet in formal session about two weeks prior to a Defense Acquisition Board or Major Automated Information Systems Review Council review to determine if the program is ready to go forward for a decision, and what (if any) issues should be referred to the Defense Acquisition Board or Major Automated Information Systems

Review Council for resolution. The Overarching Integrated Product Team leader provides an assessment of the program's status to the Under Secretary of Defense (Acquisition & Technology)/Assistant Secretary of Defense (Command, Control, Communications, & Intelligence [C<sup>3</sup>I]) at major decision points.

There should be no surprises as members of the Overarching Integrated Product Team will have been coordinating with or participating in Working Level Integrated Product Teams, and addressing issues throughout the previous phase. For ACAT ID programs, the Under Secretary of Defense (Acquisition & Technology) will be pre-briefed at a Defense Acquisition Board Readiness Meeting. If there are no outstanding issues, a formal Defense Acquisition Board review may not be required. This is referred to as a "paper Defense Acquisition Board," where the draft Acquisition Decision Memorandum and supporting information is provided to Defense Acquisition Board principals for concurrence, then to the Under Secretary of Defense (Acquisition & Technology) for approval and signature.

### **Acquisition Program Information**

Information required to support a milestone decision is determined through the Integrated Product Team process, and approved by the Milestone Decision Authority. There is no standard set of documents, reports, or other information, except for those required by law and regulation. Even then, many of these may be tailored or streamlined. Additionally, Milestone Decision Authorities may have some unique information or documentation requirements based on component-unique management considerations, such as some annexes to the Operational Requirements Document required by the Army and the Air Force.

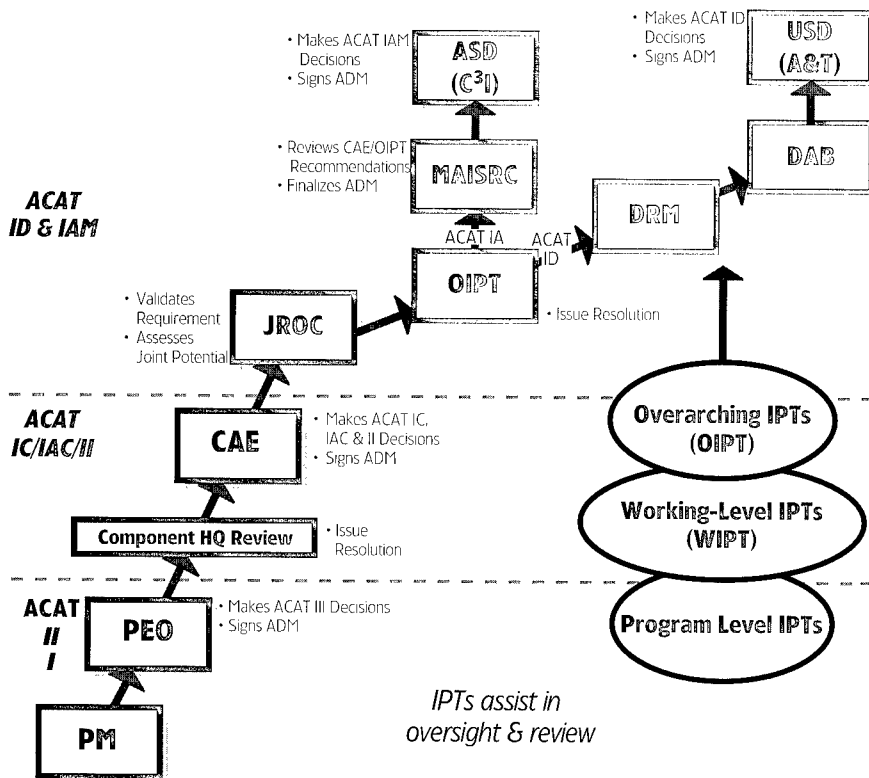
The concept of "tailoring in" is used to minimize and streamline required information. With the exception of formats for the Operational Requirements Document, Test and Evaluation Master

Plan, and Acquisition Program Baseline in DoD 5000.2-R, formats are optional. The mandatory elements for an ACAT I or IA program acquisition strategy are listed in DoD 5000.2-R. The Acquisition Deskbook provides suggested formats for some documents and reports. Program managers are not required to submit mandatory information as stand-alone documents and may combine required information into a single document if they so desire.

With the exception of program plans requiring approval at the Office of the Secretary of Defense level by statute (e.g., the Test and Evaluation Master Plan for some programs), plans are working-level documents, and are not required to be submitted for staff review or approval. Information required for each program may vary considerably depending on the ACAT, consensus reached through the Integrated Product Team process, and desires of the Milestone Decision Authority. Unlike the previous 5000 series, no tables or charts are included to use as a ready reference for required milestone information or documentation. The Deskbook may provide some of this information, or the reader may refer to course material from the Defense Systems Management College or implementing instructions from the Components.

Although DoD 5000.2-R generally applies only to Major Defense Acquisition Programs and Major Automated Information Systems, other information elements and requirements also extend to ACAT II and III programs. For example, all acquisition programs must have an acquisition program baseline. Programs categorized as ACAT II are major systems that may be subject to live fire test and evaluation. Likewise, ACAT II or ACAT III programs may be designated Office of the Secretary of Defense Test and Evaluation Oversight programs, subject to the same oversight that ACAT I programs receive. The DoD 5000.2-R requires the acquisition strategy for ACAT I or IA programs to have CAIV objectives and a risk assessment. Fur-

Figure 5. Milestone Review Process (Illustrative)



ther, DoDD 5000.1 requires all programs to establish CAIV objectives and assess risks. The Core Management Issues in the executive summary include the requirement for an acquisition strategy for all programs. Milestone Decision Authorities may require whatever information they need to support these Core Management Issues.

## Conclusion

This article's focus has been primarily on top-level policies and procedures, and the oversight and review process. Policies and procedures for non-major acquisition programs are mentioned here only when they can be referenced to the new 5000 series, or another current and authoritative reference. The Components will publish implementing instructions, and must decide on mandatory procedures for ACAT II and III programs.

Although the recent acquisition reform initiatives have provided the program manager much needed flexibility, this is still a complex system driven by a variety of special interests: Members of Congress, the White House, the politi-

cal and military leadership in the Pentagon, the acquisition commands, and the fighting forces. By intentionally changing the focus of the 5000 series from all acquisition categories, to primarily major programs, the Components have been empowered to decide how to manage the non-major acquisition programs. However, DoD 5000.2-R prohibits the Milestone Decision Authority/Component Acquisition Executive from placing more stringent or additional mandatory requirements on their non-major programs.

## END NOTES

1. The Defense Acquisition Deskbook is an automated repository of information consisting of a Desk Reference Set, a Tool Catalog, and a Forum for the exchange of information. The Reference Set will contain both mandatory guidance (i.e., DoDD 5000.1 and DoD 5000.2-R), and discretionary information. The Deskbook will be released in CD-ROM format in May/June, 1996.
2. Component as used here refers to Military Departments and Defense Agencies with acquisition responsibilities. Military Department Acquisition

Executives are also referred to as Service Acquisition Executives or SAEs. Automated Information Systems decisions may be made by the Component Acquisition Executive, or delegated to a Component Chief Information Officer. One unified command, the Special Operations Command, has an Acquisition Executive.

3. ACAT II category does not apply to Automated Information Systems.

4. The format for the Acquisition Program Baseline and the Glossary were not ready for the 15 March versions and will be published with Change 1.

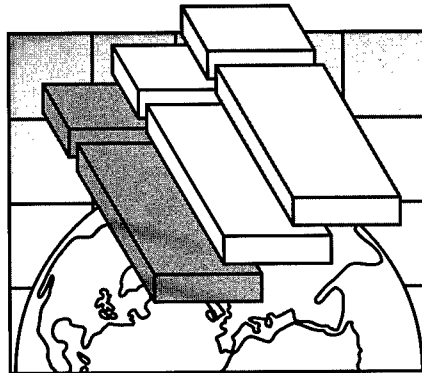
5. Principal Staff Assistants represent the user community in the functional area under their direction on acquisition and requirements matters for Automated Information Systems. Office of the Secretary of Defense Principal Staff Assistants are the Under and Assistant Secretaries of Defense; Director of Defense Research and Engineering; Director, Operational Test and Evaluation; General Counsel of DoD; the DoD Inspector General; the Assistants to the Secretary of Defense; and Office of the Secretary of Defense directors or equivalents who report directly to the Secretary or Deputy Secretary of Defense (DoDD 5000.1, par C.9.).

## REFERENCES

1. DoD Directive 5000.1, *Defense Acquisition*, March 15, 1996.
2. DoD Regulation 5000.2-R, *Mandatory Procedures for Major Defense Acquisition Programs (MDAP) and Major Automated Information Systems (MAIS) Acquisition Programs*, March 15, 1996.
3. *Rules of the Road, A Guide for Leading Successful Integrated Product Teams*, November 1995, Office of the Under Secretary of Defense (Acquisition & Technology)/API and Assistant Secretary of Defense, Command, Control, Communications & Intelligence (C<sup>3</sup>I).
4. Office of Management and Budget Circular A-109, *Major Systems Acquisition*, April 5, 1976.
5. Chairman, Joint Chiefs of Staff Memorandum of Policy No. 77, *Requirements Generation System Policies and Procedures*, September 17, 1992.

# CALL FOR ABSTRACTS

## 1997 ACQUISITION RESEARCH SYMPOSIUM



**Sponsored by the Deputy Under Secretary of Defense  
for Acquisition Reform  
Co-hosted by the Defense Systems Management College and  
the National Contract Management Association,  
Washington, D.C. Chapter**

**DoubleTree Hotel • Rockville, Maryland • June 25-27, 1997**

The 1997 theme is "Acquisition for the Future: Imagination, Innovation, and Implementation." Abstracts of papers that address the theme and current issues in acquisition management will be especially relevant. Topic areas include:

- Acquisition Management Education and Workforce
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- Cost and Resource Management
- Engineering, Manufacturing and Logistics
- International Acquisition Issues
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- Industrial Base/Privatization
- Federal Acquisition and the Political Process
- Process Reengineering
- Systems Performance and Test/Evaluation

Submit a one-page abstract no later than **July 26, 1996**. Send your abstract via E-mail, postal service, or facsimile. Contact information and the mailing address are listed below. To be fairly considered, all abstracts should include the **Title, Proposed Topic Area, Author(s)' Name(s), Business Address(es), Telephone Number(s), and E-mail Address(es)** (if available). If more than one author is listed, please provide the name of the contact author, and we will address all future communications with that person. You will be notified by **September 30, 1996**, whether your abstract is selected.

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E-mail Address: [sablej@dsmc.dsm.mil](mailto:sablej@dsmc.dsm.mil)  
Telephone #: (703) 805-5406/2525  
DSN #: 655-5406  
Facsimile: (703) 805-3856

I read with great interest the well-written and exceedingly thoughtful article written by James Dobbins entitled, "Adequacy of ISO 9000 Certification for DoD Weapon System Software Development Contractors," which appeared in the March-April 1996 *Program Manager* magazine. I am as impressed with the wisdom evinced in the recommendations to the readers as with Dobbins' expertise in the subject matter.

I work within the acquisition organization of the Federal Aviation Administration (FAA) in the area of human factors engineering. I spent a number of years in DoD prior to joining the FAA four years ago.

You may find my motivations oblique to those of your other readers; but from the standpoint of other disciplines, a similar dilemma exists. Human factors

Your March/April 1996 article entitled "Performance-based Management — The Devil is Truly in the Details," by James Gill unfortunately completely misses the mark. A major paradigm shift has occurred in private industry during the last decade. The paradigm shift has dramatically transformed the relationship between vendor, system supplier, and customer. During this decade, manufacturers have established and nurtured long-term relationships with both their suppliers and their customers. These relationships focus on teaming, partnering, and a *reasonable* profit to be earned by the suppliers in return for a quality product that meets or exceeds requisite customer performance parameters. Ultimately, the contractor and his suppliers receive a reasonable profit, and the customer receives satisfaction with the product or service purchased. If the product or service fails to meet performance, price, or delivery expectations of the customer, then the laws of the competitive marketplace will slowly doom the supplier and his vendors.

The Federal Acquisition Streamlining Act (FASA) of 1994, through offering compensation incentives to all Program Management Team members, attempts to expand this partnering concept to federal agency customers and their service/product suppliers. Mr. Gill desires to *retain* that contractor-customer adversarial relationship that has led to contractors frequently supplying minimum performance equipment or services

standards and quality certifications face a future common to the software capability maturity models and quality assurance programs. Because the FAA is undergoing acquisition reforms similar to those in DoD, it often finds itself not sure what to hang on to as it lets go of old practices. Dobbins' advice is welcome news to many, and particularly to those of us who see the focus on quality as he does — a long-term commitment at many levels to continuous improvement in process, procedure, technical capability, training, and personnel expertise.

Thanks for taking the time to write such an important article.

**Glen Hewitt**

Federal Aviation Administration

to the government customer, frequently coupled with product delivery slippage.

The existing government/contractor bureaucracy to manage, price, control, negotiate, and audit these supplier customer contracts is a major disincentive to either party proposing a process change. Why not compensate those program management personnel initiating the necessary process revisions and accepting prudent acquisition risks? The resultant process changes only occur by agreement by both parties to implement the changes and generate acquisition/life cycle program savings. Those program personnel who confront the bureaucracy and succeed in changing the paradigm deserve monetary recognition for their efforts. Private industry pays performance bonuses to employees who meet or exceed sales or profit goals. Government should offer the same opportunity. In this era of employee downsizing and limited promotion opportunity, this may be the only method to retain competent personnel for the future. Along with the "carrot" of performance compensation, one must be ready to apply the "stick" of program cancellation or team replacement, if the contractor/Program Team fails to meet the requisite established cost, schedule, and performance goals stated in the contract.

**Dennis Malloy**

4214 Avon Drive  
Montclair, Va.

# Mousetrap — Serious Fun for Grown-ups

## An Integrated Product and Process Development That Keeps Going...and Going...and Going

RANDY C. ZITTEL • ROBERT H. LIGHTSEY

**T**he late David Packard, as Deputy Secretary of Defense in 1971, founded the Defense Systems Management College (DSMC) to establish an intensive five-month course, which covered all aspects of acquisition and state-of-the-art managerial techniques. Known as the Program Management Course (PMC), this 20-week course met the congressional mandate that all DoD Acquisition program managers be educated in the complete range of acquisition management activities prior to assuming command of their programs. Currently, DSMC uses a number of in-class simulations that put future program managers in situations where they learn proven and timely "hands-on" applications to hone their skills beyond theory.

### SEGV Simulation

The Stored Energy Ground Vehicle (SEGV) simulation began in 1988 as a small elective in the PMC to provide this hands-on experience that conventional classes did not provide. Interested individuals in the PMC classes of future program managers over the past seven years have since taken the SEGV elective. This historical pool of over 500 students has organized as integrated product teams (IPT) within "corporations" to work from the contractor's perspective.

As a joint integrated simulation supported by five functional faculty departments, the SEGV simulation was done *outside* of the traditional classroom. Student teams planned and managed their personal study time, accounted for each hour in a labor accounting system while designing a simulated, scaled-down, unmanned ground vehicle capable of ammunition resupply through a mine field. The simulation proved itself so effective in achieving the curriculum objectives that students were credited for five depart-

mental exams and the entire individual learning program, thus compensating traditional class time with learner-directed learning.

### Imitation — The Sincerest Form of Flattery

The exercise has been highly successful and communicates the essence of



*Zittel is a Professor of Systems Engineering Management, Faculty Division, DSMC. He is currently the editor for the upcoming DSMC Systems Engineering Management Guide, 4th Ed.  
Lightsey is a Professor of Systems Engineering Management, Faculty Division, DSMC.*



program development so well, that Rockwell International Corp., integrated the Mousetrap exercise into the tutorial to their extensive Computer-aided Systems Engineering Tool Set (CASETS™).<sup>1</sup> One of the great equalizers of the original SEGV simulation is that it used up to four commercial rat traps as the sole power source. (We originally used mousetraps in 1988; the nickname "Mousetrap" stuck.) The use of such a novel power source helps to equalize engineers and non-engineers to apply integrated product development without making everyone an engineer. In addition, the

Universities of Arizona and South Australia are separately adding DSMC's SEGV exercise to their graduate systems engineering curricula.

### They're On Their Own

At the simulation start, work groups analyze a Request for Proposal and develop a proposal in response. Starting at contract award,<sup>2</sup> the teams operated on their own with

**As teams progressed through the simulation, they applied the systems engineering process iteratively, as their system took form. They extracted the requirements, conducted trade studies and engineering analyses on the government-designated power source, and considered different solutions to each problem.**

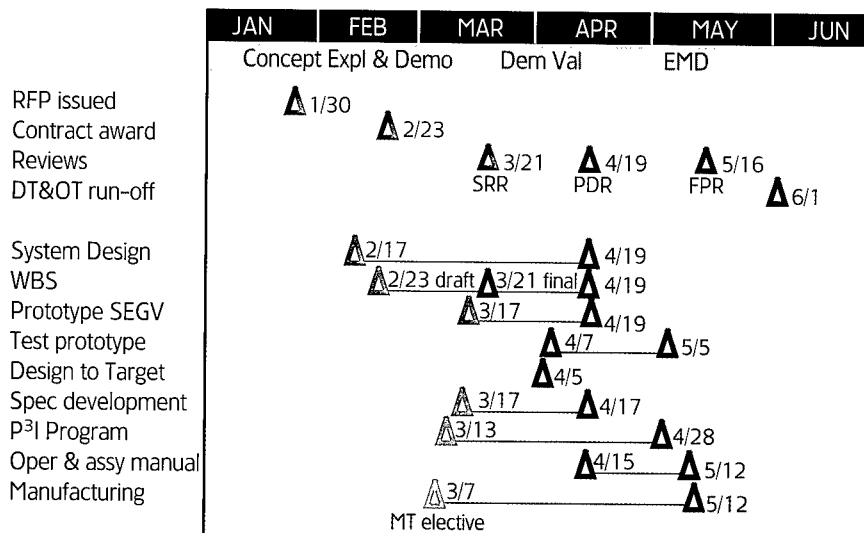
All technical design reviews were held outside of formal classes and were strictly time limited. Figure 1 shows a company's program schedule.

### When Enough Engineering is Enough

Over the past seven years, teams have averaged 50 to 200 manhours *per team member*. It is remarkable to see that the most successful teams always expended fewer labor hours than the less effective teams. We ascribe that to more cooperative and effective IPT operations, team personnel chemistry, and simply but critically deciding *when enough engineering is enough*. It is interesting to note that the more actual engineers on a team, the more difficult it was to finish their design and move on.

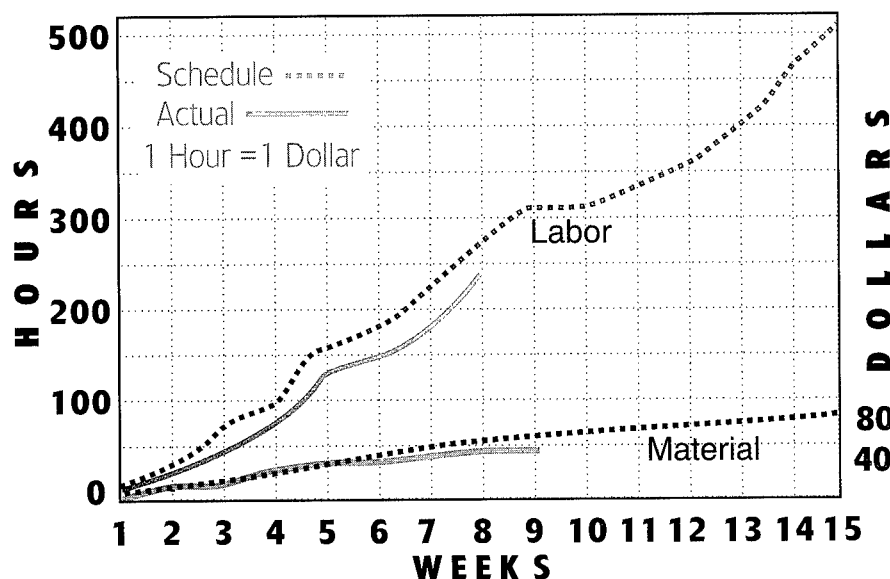
As teams progressed through the simulation, they applied the systems engineering process iteratively, as their system took form. They extracted the requirements, conducted trade studies and engineering analyses on the government-designated power source, and considered different solutions to each problem. Each IPT member was continuously exposed to all issues, even when not directly involved. This made the business manager more understanding of the engineering problems, and the engineers saw how their continuous designing ramped up labor and material costs.

Figure 1. IPT Program Schedule



no faculty assistance, unless requested. The first faculty evaluation was at the Systems Requirements Review held five weeks later by a government Program Management Office's IPT staffed by the five faculty departments.

Figure 2. **Labor/Material Baselines**



### The Proof of Their Decisions

The teams developed a pre-planned product improvement concept that incorporated software into the system. Operated in parallel with a decision briefing requirement for each student, Mousetrap required the team to succeed or fail as a team and demonstrate their ability to brief to a clear decision. They knew the prototype demonstrated the strength of their information and judgment far better than any set of assumptions, which forced them to be accurate and correct.

At the third technical review, the proof of their decisions was the Engineering and Manufacturing Development (EMD) prototype, which sat on the table between their "company" and the government Program Management Office staff.

### The Performance "Run-off"

The simulation was complete when all technical documentation, a formal accounting audit by the contracting officer, end-item-vehicle (EIV) material/cost audit, and performance "run-off" were accomplished. The competitive "run-off" brought the conflicting performance requirements together to see how well the companies actually managed their red teaming to win the production contract through a four-hour developmental test and evalua-

tion (DT&E). Additionally, each team developed their manufacturing capacity analysis using the Factory Simulation™ software, and was evaluated on their prototype's producibility.

### Open Competition — A Powerful Lesson

The constant tracking of labor hours against additional design effort resulted in a fresh appreciation for commercial cost and profit issues, as shown in Figure 2. We believe this was the greatest "reality check" the government participants took away. Mousetrap forced them to balance against what must actually be done to win against all other competitors, not against the government's minimum contract requirements. Their dealing in the obscure world of open competition was an extremely powerful lesson.

Through a best value analysis, performance and design-to-cost had equal weight. Since there was only one final winner, many of the first-place performers have historically lost to the second or third performer who provided a better life-cycle balance of performance, user friendliness, manufacturability, durability, and vehicle cost.

The entire PMC student body was released from class to observe the final

results at the run-off. This reinforced the effective implementation of systems engineering to the entire student body. Nothing focuses a student's attention more than presenting in front of one's peers — all 420 of whom they've worked with for months.

### Mousetrap Has No Tricks

As the largest and longest "elective" in the PMC, the remaining elements of the 14 student sections saw the Mousetrap IPT's efforts evolve from concept to the EMD prototype.

Mousetrap has no tricks, changing government requirements or "rubber baselines." The single contract extended from Concept Exploration/Definition to the middle of EMD, which gave each IPT real experience in all three phases.

### Serious Fun for Grown-ups

Proving there's still a kid in all of us, the teams came up with very novel company names. Some examples are *Fievel & Friends*; "RAT"tle Trap, Inc.; *Belvoir Mouseworks* (BMW); *KL Meower*; and *Traps 'R Us*. Elementary and high school students and girl scout troops have attended the DT&E run-off, and marveled at the serious fun of grown-ups. The age old truth of learning more when you enjoy it reinforced this effort.

### Wider Applications of Mousetrap

The key outputs of the Mousetrap simulation have found greater application in other mandatory acquisition courses, where more junior members can see where a system comes from, the documentation generated during the stages of the development process, and ultimately a final engineering hardware model. This enhances their understanding of the overall process.

### The New, Improved Mousetrap!

In 1995 DSMC streamlined the PMC to 14 weeks (from the original 20 weeks) and designated the new course as the Advanced Program Management Course (APMC). The streamlined course was piloted in 1995, and

the APMC format is now used for all classes. The objectives established for systems engineering instruction in the APMC included the expectation that all students would go through the process of translating operational requirements into designs that met those requirements. After analysis and consideration of alternatives, the decision was to use the Mousetrap exercise as the core around which the systems engineering instruction in APMC would be developed.

The systems engineering and test and evaluation courses of instruction now combine traditional classroom instruction with exercises that are related to the Mousetrap project. For example, students outline configuration management plans or perform risk analyses that are based upon their assessments of the requirements and circumstances associated with the design, development, and test of the Mousetrap vehicle. Teams are provided an Operational Requirements Document and a System Specification, in addition to other procurement documents, at the beginning of the course. Classes combine limited lecture and extensive discussion with hands-on exercises as the Mousetrap project is first planned for, then designed, fabricated, and finally tested against the original requirements. Each work group takes the role of contractor and acts as an IPT as they progress through the systems engineering process from requirements analysis to design, fabrication, and verification. All IPTs receive the same kit of parts to

work from as they consider alternative design solutions.

Students prepare for and present two formal design reviews where they first prepare system-level designs, then preliminary subsystem designs, and then prototype vehicles. These reviews are taken by members of the test and evaluation and systems engineering faculty acting as government program managers. The final class period consists of the verification session. Here the Test and Evaluation Department and the Systems Engineering Department faculty conduct tests against the requirements of the specification to verify that the students have, in fact, produced vehicles which meet contract requirements. The requirements include performance requirements constrained against cost and producibility goals. The students trade performance against cost and producibility, and also bear in mind that they are competing with other "contractors" to win a future production contract.<sup>3</sup> Some students choose lowest cost minimum performance strategies, while others may take a less risky approach to ensure that requirements are met. The reviews and the run-off give everyone a chance to observe and think about the trade-off between performance and cost, and the risks associated with alternative strategies. In summary, this exercise enables the students to experience some of the difficulties, frustrations, and exhilaration associated with development and procurement in a competitive environment.

Figure 3 shows a section's results, indicating three of the five companies' engineering prototypes failed to meet all contract requirements. The remaining two companies met all requirements, but RATS, Inc., was quite superior to the other vehicle in cost and producibility. With cost as an independent variable and weighted performance criteria, a clear winner could be determined. The important aspect is the ability to compare all technical and non-technical requirements in a life cycle balance across all processes.

## Conclusions

The Mousetrap SEGV exercise has gone from a small effort using single mousetraps in 1988, to rat traps, virtual prototyping, and computer-aided tools in 1996. It brings together so many issues, incentives, and forces that the participants succeed in getting a deeper understanding of the power of integrated product and process development, the integrated process team, the systems engineering process, and the contractor's perspective.

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Figure 3. **Government Acceptance Tests for APMC 96-1**

Company IPT	DTC	Producibility Index	Assembly Time (sec.)	Distance Run (ft.)	Resupply (sec.)	Recovery (ft.)
Rat'l Trap Inc.	\$1,061	1694	10:11	Pass	1:35	14'3"
Beefys Engineering	1,054	627	10:11	Pass	1:46	8'0"
Reluctant Synergists	667	476	8:30	Pass	<b>2:50</b>	7'3"
Butt 'N' Heads, Inc.	612	325	8:41	Pass	<b>2:40</b>	6'2"
RATS, Inc.	703	348	7:30	Pass	1:21	5'3"
Contract Specification	<1,100	No spec. - less is better	<12:00	25' in <7 sec.	<2:00	>5'0"

Note: Colored bold numbers reflect items that failed to meet contract specifications.



needs, who return to work environments of a specific and known nature. Therefore our curriculum is designed (or should be) to meet the specific needs of the customers and the environment in which they work.

This environment relies on teams of diverse people with varying fields of expertise having a shared vision. Assessment of learning in this environment should be competency (performance) based on specific behaviors required in that work environment.

To be sure, American Higher Education is examining assessment/evaluation versus testing, and there is a wealth of research in this area. Some of that research I have used in writing this article. But the purpose of this article is not to change American Higher Education, but to enlighten individuals and institutions on the benefits of assessing/evaluating processes (curricula) versus testing individuals in general, and specifically the consortium schools. To do

**Currently, [testing] it is used to assess the learning that is or is not taking place while the class is in process (formative). If the instructors determine that the learning has not taken effect to the degree and level desired, then they have the opportunity to "teach" on the spot.**

#### **In the Beginning — PMC**

The PMC course was a fine course, which brought together military and civilian students from five Services and industry, with diverse backgrounds, experience, and education. Admittedly, PMC had a challenging curriculum covering functional areas from Management Development to Systems Engineering. The faculty and staff worked diligently to ensure that the subject matter was current with the best practices of the industry and the latest policy.

A class at DSMC was divided into 30-student sections, each section into 5 or 6 student work groups. During the conduct of the course, sections and work groups were divided and then reconstituted in order to provide each

individual student an opportunity to be exposed to as many other students and their unique experiences and perspectives as possible.

The curriculum mirrored how we did work in the program office. The students had opportunities to perform in experiential exercises that simulated a real work environment. Some of these exercises took as long as 75 hours of class time, had a multi-objective approach, and required changing of student leadership, and roles.

Our Management Development course emphasized teams, optimum team functioning, the strength of a team, the importance of a team in acquisition management, and one's responsibilities as a team member. The entire purpose of the structure of the section/work groups, the design of the curriculum and the exercises, and other experiential exposure was to prepare graduates to be "competent" members of the Acquisition Corps. We wanted DSMC students to leave with more than mere knowledge and understanding of weapons systems acquisition, but to also apply, analyze, synthesize, and evaluate programs while a member of a team.

#### **But Are We Teaching Them Anything?**

Of course we all know that being a member of a team may mean we must sublimate personal goals for group goals. It is an attitude, a value, that puts the mission ahead of the individual. We were doing well, with high satisfaction ratings from all customers. Then someone asked the question, "How do we know we are teaching anyone anything?"

This is a legitimate question that should be asked by any organization in the education business. However since we all come from an education system that emphasizes and rewards individual accomplishments rather than group successes, we turned to "testing" as the way we were going to measure the learning effectiveness of this institution. Was testing effective?



that, let me first tell you a true story about how it was in the old Program Management Course (PMC) and how it is now in the Advanced Program Management Course (APMC) at DSMC.

Did we gain insight into the reliability and validity of our educational processes? Did we foster team membership? Did we create a learning environment?

What we created was a fiercely competitive atmosphere where students at times withheld information from other students; "gamed" the test by studying old tests to determine which functional area had the most questions; how frequently that question appeared on the test to determine the probability of being on the next; and worst of all, in my opinion, they traded off learning of the subject matter to learning the test.

It was commonplace, even encouraged, for sections to divide the Desired Learning Outcomes (DLO) among the section "experts." Those individuals would write a short answer to address a particular DLO so that the majority of the section could learn an "abridged" answer which would satisfy a question on the test. No one wanted, or in their mind could afford career-wise, a low score.

### **Is Testing Paramount, And Learning Secondary?**

In the end, maximizing the test became paramount; learning became secondary. We tried many ways to reduce what we labeled "test anxiety." We eliminated the grades and replaced them with "pass" or not yet. We attempted to eliminate the "finals" atmosphere of the end-of-course test by giving smaller and more frequent tests. We went from predominantly "multiple choice/fill in the blank" tests to more comprehensive essay types. In the end, we abandoned testing students to assessment of the curriculum process.

That is not to say that there is no place for formative (in-process testing) or summative (end-of-course assessment), and that there is no testing in the new PMC (now called the Advanced Program Management Course, or APMC). There is room for some of both to be sure. Currently, it is used to assess the learning that is or is not taking place while the class is in

process (formative). If the instructors determine that the learning has not taken effect to the degree and level desired, then they have the opportunity to "teach" on the spot.

Test instruments are also used by some functional areas at the end of the course of instruction to assess whether the desired learning outcomes have taken place and to what degree (summative). If, across the entire class, the results of the assessment indicate that the desired learning has not taken place to the degree desired, it may mean there is a design flaw. Obviously, that should be corrected prior to the next iteration of the subject matter.

It is important to understand that it is not necessarily the evaluation "instrument" that is objectionable, but the use of the data collected by that instrument. If the instrument is used to assess the progress of learning of the group (aggregate of individuals' performances) in order to make immediate adjustment to the process, or to determine the validity and reliability of the design, it is worthwhile. If the instrument and the resultant data are used to seek the "best and the brightest," it becomes an incentive to do well on the test and to abandon adult learning. This is an example of what I believe is Maslow's paradigm of the "Self-Actualization" (Combs, Avila, Purkey, 1971) in that if we are to be hired/fired/promoted/demoted based on a "test," survival takes precedent over self-actualization, and our priority will be to maximize the test, not learn all we can.

### **Testing — A Continual Struggle**

In the new APMC the designers have abandoned "testing" individuals for the purpose of determining the best and the brightest and embraced assessment and evaluation. We have adopted a quality approach to education. That is, if students are competent, and have the appropriate background in education and experience, and the curriculum (process) is sound, then they will learn to the level required,

and we do not have to test each individual.

Now don't take my word for it; there is and has been a continual struggle within the education community as to the value and purpose of testing. This article is written to address this issue as it pertains to education in general and, specifically, to the mission and purpose of teaching acquisition management to adults.

To most of us who have been brought up in an educational system that tends to *test* the progress of the student rather than effectiveness of the program, we intuitively assume that traditional grading accurately displays the quality and the quantity of learning that has taken place. Contemporary research, however, clearly refutes this premise (Knowles, 1980; Nadler, 1982; Harvey, 1977).<sup>1,2,3</sup> Traditional grading is weak enough with adolescents; it becomes less relevant with adults (Knowles, 1980; Nadler, 1982).

What the research seems to suggest is whether we want to evaluate or not evaluate, who we evaluate, and how we evaluate is really a conflict of values (Knowles, 1980, p. 201). On one hand, we have the behaviorists who need hard data, proof, science, and who value control. On the other hand are those who espouse Maslow's values of self-actualization, free play of natural forces, and place a high value on the humanistic aspects of management. Since both of these points of view are present and valued in our society, a position in the middle is probably what will take us the furthest in evaluation as adult educators (Knowles, 1980).

### **Two Dominant Themes Emerge — Quantification and Involvement**

Experienced faculty observed this phenomenon in the PMC course when we had three major tests. As I previously mentioned in this article, we observed "gaming" of the test by students in a section who divide the DLOs amongst themselves. Therefore, one out of 30

students might know the DLO well; the other 29 might know only enough to answer that question on the test. Additionally, the class would gather former tests and study the design. They would ascertain how many times a question showed up on a final to determine the probability that the question would be on the next final. The resultant energy expended and stress generated actually detracted from the learning opportunity. This is the antithesis of an adult learning atmosphere.

Knowles (1980) goes on to say that how much and what type of evaluation you will apply to adult education is simply but unequivocally, a product of our philosophy and definition of education. Therefore, if instructors define their responsibilities as "[for] making changes in a human being," then they do incur an obligation to efficiently obtain data to ensure they are producing maximum change, in the shortest amount of time, for the least cost. The dominant theme in this case would be *quantification*.

If, however, one's definition of adult education is facilitating and providing resources for *self-directed* inquiry and self-development, one incurs an obligation to involve the students in collecting the data that will enable them to assess the effectiveness of the program in helping them meet their objectives. The dominant theme in that case is *involvement*. The difference is simply the conflict of pedagogy versus andragogy (Knowles, 1980).

Cremin (1976, pp. 88-89)<sup>4</sup> speaks eloquently on the heart of the problem when he admonishes us to develop better techniques for monitoring and assessing education. He states:

For all our sophistication in *testing* [emphasis applied] — and we have made tremendous strides in the last decade or so — our instruments are still imprecise about what should be evaluated and to what purpose. They deal almost exclusively with the cog-

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nitive aspects of learning. They tend to *separate individuals for the purposes of selection* [emphasis applied] rather than providing information on the performance of the education system as a whole...

Whitlock (1986, pp. 74-76)<sup>5</sup> writes in a fascinating little book, *Educational Myths I Have Known and Loved*, a significant chapter entitled, "The Myth That Grades Are Important." In this chapter, he points out that "grades are always relative." At the present time, and as long as grade inflation remains with us, even the relative value of grades has disappeared. He further argues that:

Faculty members depend on grades almost as much as students do — perhaps even more. They are a crutch, and a traditional crutch on which there is enough agreement to make the system work, even though it

may be ultimately dishonest. (For example, why are an 89 and an 80 the same grade when 80 and 79 are different?)

### **"The Art of Gaming"**

Whitlock's point of view corresponds with Dixon (1990, p. 32)<sup>6</sup> who intimates that when instructors are rewarded for high ratings [could be high grades], they tend to modify their behavior to ensure student enjoyment. I have observed professors here and in other institutions who teach to the test, not to the subject. Why, haven't we institutionalized the Scholastic Aptitude Test (SAT)? Haven't we institutionalized it to such a degree that parents pay exorbitant amounts of money to prepare their children to do well on the test? We have whole industries who prepare people for the SAT, LSAT, GMAT, GRE, etc. My own research has shown that as a predictor of success in college, the SAT is only the third best, preceded by Grade Point Average, and of all things, "Family Income." Additionally, the verbal scores in the SAT were the predictor, and in the population I studied the math portion predictability was not significant. (Scafati, 1990).<sup>7</sup>

Continuing with Whitlock's myths (1986, p. 75), he contends that some of the best students receive "C's." The reason, he insists, is because "they refuse to 'learn the teacher' rather than the subject." Another name for this process could be "The Art of Gaming," which is a euphemism for learning how to play the teacher rather than learn the material.

### **True Definition of Evaluation**

We have come a long way since 1979 in evaluation processes. After reviewing the literature, it has become abundantly clear to this author that the true definition of evaluation is dependent on the purpose of the evaluation. The purposes are many and, therefore, the definitions are varied. In the following paragraphs, I have tried to describe some of the current thinking regarding evaluation in training and education.

Knowles, in his 1980 book, *The Modern Practice of Adult Education*,<sup>7</sup> quotes Stufflebeam in that evaluation serves two purposes:

- The first is *accountability* – justification of the value of the program to employers, sponsors, the clientele, or society. This he calls summative evaluation.
- The second purpose is to improve *decision making* by providing information to the [course] program managers that will enable them to improve the quality of the program. This calls for formative evaluation.

Both types of evaluation must take into account the four elements of the program: goals, design, process, and product.

Nadler (1982) emphasizes that the purpose of evaluation is to ensure the design is valid and reliable and that modification to improve outcomes is present. At no time does he advance the proposition that evaluation is to determine the standing of the student or the competency of the instructor.

Clark (1989)<sup>8</sup> states that the purpose of assessment is to determine the effect of the training. At no time does she allude that we need to test individuals except as a source of data to determine the effectiveness of the experience.

Phillips (1983), in the *Handbook of Training Evaluation and Measurement Methods*,<sup>9</sup> lists eight purposes – most of which are in consonance with the literature: (He speaks of “HRD” [Human Resource Development], which is in essence *training*.)

- To determine whether the program is accomplishing its objectives. (*Reliability*)
- To identify the strengths and weaknesses in the HRD process.
- To determine the cost/benefit ratio of an HRD program.
- To decide who should participate in future programs.

- To identify which participants benefited most from the program.
- To reinforce major points made to the participant.
- To gather data to assist in marketing future programs.
- To determine if the program was appropriate. (*Validity*)

What is clear in all these purposes is that nowhere do we see that the purpose is for selection or discrimination among or between students. In general, the purpose is to assess the reliability and the validity of the program and to provide feedback to the student and the organization on the degree and quality of the learning that has taken place. Finally, the assessment process is another opportunity (in an experiential way), of reinforcing learning or moving up the taxonomy of learning.

Dixon (1990, p. 27) cites Kirkpatrick et al in that the purpose of evaluation remains the same: to improve the learning experience and not to measure, assess, or grade the student.

Assumptions and other myths about assessment and evaluation: Who Should Evaluate? Every person who is involved in any way with the development or the execution of an adult program should evaluate the program from their personal perspective (Knowles, 1980, pp. 204-205).

### As I See It

In my journey through the literature referenced in this article, the following conclusions have become clear:

- Evaluation is valuable.
- There are ethical considerations, in that an institution of learning has an ethical responsibility to provide the product it contracts to deliver.
- The only way to ensure this is being done in a quality way is to evaluate the process and the outcomes.
- The purpose of evaluation is not to define the difference among or between students.
- The purpose of evaluation is to ensure reliability and validity of the program.

- Both formative and summative evaluation are important.
- The real proof of the program is measured after some time has elapsed, and where the job for which the program was designed, is performed.

### Recommendations

From the above conclusions, the following recommendations are made for all institutions whose purpose is to graduate persons who can effectively “perform” in the workforce.

- That they develop an evaluation program with the express purpose of improving the product provided to their customers. (The customers in this case are the students, their immediate supervisors, and the acquisition community.)
- That the types of evaluation conducted would be Formative, Summative, and performance-based.
- That the evaluation process be concurrent with the design of the courses, and indeed, the design process be iterative so that any changes to form or process will be incorporated during course upgrade.

### My Conclusions

I believe we at DSMC are heading in the right direction. We still need to do more work in assessing our process of creating an adult learning environment. We need to develop a process that provides “Dash Board” indicators that learning is happening. While the lesson is in progress, we can gauge whether the students as a group have learned the subject at the desired level (formative assessment). We must also develop a process that determines whether the objectives of the course have been reached by the class to the desired learning level (summative assessment), and be prepared to change the design when it does not meet the outcomes reliably. If we accomplish these goals, we will not only be following some of the best minds in education, but also adhering to the teachings of some of the best minds in quality.



In conclusion, if the material we use to produce something is sound (the student); the process we use to produce the product is sound (the curriculum); the equipment is appropriate for the task (course materials); and the worker has the required skills (faculty), then there is no need to inspect (test) at the end of production (graduation)! We will have gathered enough empirical data along the way to assess the learning, improve the process, and satisfy those who need proof of the results.

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## DID ANYONE SEE A BIG BUNNY GO BY HERE?

Greg Caruth

The Easter Bunny made his traditional stop at DSMC to visit exceptional family members and friends from Fort Belvoir, Va., on March 30. The coordinator of the Ninth Annual Easter Egg Hunt was SSG Pam Milliner-Williams, USA. Many volunteers gave their time and energy to a memorable day that left everyone thankful for the fun and games – and spring sunshine. Highlights included a ring toss, pinata, egg decorating, a visit with Mr. Bunny, egg hunt, basketball toss, and bowling. Hot dogs were donated by the Commissary. The Easter Egg Hunt was held in cooperation with Alma Keating and the Army Community Service.



TIFFANY CRANE, AGE 5, HAS A ONE-ON-ONE WITH MR. EASTER BUNNY. THANKS TO DAVE SCIBETTA, DEPUTY DEAN, DIVISION OF COLLEGE ADMINISTRATION & SERVICES, FOR ARRANGING MR. BUNNY'S VISIT.

# Manufacturing Questions Program Managers Should Ask

## PMSC — Meeting the Needs of ACAT III Program Managers

LT. COL. ROBERT HARTZELL, USAF • LT. COL. DAVE SCHMITZ, USAF

**T**he Acquisition Management Functional Board approved establishment of an assignment-specific course for Acquisition Category III (ACAT III) program managers/deputy program managers (PM/DPM), called the Program Managers Survival Course (PMSC). The College created and structured the course to meet the special needs of ACAT III PMs, which include a different set of leadership and managerial challenges, and less depth of support than normally given to ACAT I and II PMs. One of the areas covered in this two-week survival skills course is manufacturing management. This first article in a series will discuss several design tools available to bring manufacturing considerations into the design process earlier, and risk reduction through the application of a quality system. Future articles will address other manufacturing topics of interest to the PM.

### What is Manufacturing?

The term "manufacturing" covers a broad set of functional tasks required to harness all the elements needed to make a product. Included are such wide-ranging topics as the National Technology and Industrial Base (NTIB) capabilities to support the program, influencing the design for cost effective manufacturing, the people and skills needed, the selection of materials, appropriate methods of production, capable machinery, scheduling, measurements, and quality assur-

ance management systems. Manufacturing requires the support of functional specialties from a diverse set of organizations, including matrix-assigned manufacturing managers, other program office functionals, con-

PROGRAM MANAGERS SURVIVAL COURSE DIRECTOR MICHAEL MEARS HOLDS A ROUNDTABLE DISCUSSION WITH THE CLASS ON OVERALL COURSE CONTENT.

STANDING FROM LEFT: CURTIS HAROLD, U.S. ARMY CIVILIAN; LT. COL. JOHN DEACON, USA; LT. COL. TIM MCKAIG, USA; LT. COL. PAT LINEHAN, USA; LT. COL. EARL SUTTON, USA; SHARON DAVIE, U.S. ARMY CIVILIAN; COL. TOM SHIVELY, USAF; LT. COL. MIKE REED, USAF. SEATED FROM LEFT: CYNTHIA MOONEY, U.S. ARMY CIVILIAN; LT. COL. CHARLES MCMASTER, USA; CHARLIE CARPENTER, U.S. AIR FORCE CIVILIAN; MARK TORMEY, U.S. ARMY CIVILIAN; COL. DEAN NAKAGAWA, USA.



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tract administration services personnel, laboratories, contractors, and commodity staffs as well as depot personnel.

Historically, 30 percent of a program's total costs are consumed by production activities. Moreover, this significant investment is spent within a relatively short amount of time. Additionally, transitioning a system from development to production has also historically proven difficult, with



ON THE LAST DAY OF THE PROGRAM MANAGERS SURVIVAL COURSE, MAY 3, 1996, COURSE DIRECTOR MICHAEL MEARS, PROFESSOR OF ENGINEERING MANAGEMENT, SCHOOL OF PROGRAM MANAGEMENT DIVISION, DSMC, PRESENTS STUDENTS A FINAL REVIEW. PICTURED FROM LEFT: MEARS; LT. COL. CHARLES McMASTER, USA; SHARON DAVIE, U.S. ARMY CIVILIAN.

attendant cost penalties. A Defense Science Board study reveals that 30 percent of our production costs are non-value added (a.k.a. cost of quality, or the Hidden Factory).

**More simplified contracting actions, increased reliance on commercial specifications and standards, and less functional support bring significant opportunities to better integrate the NTIB and make more of it available to meet DoD requirements.**

#### **What's New?**

Today's acquisition realities offer new opportunities to reduce program risks, but they also pose some new challenges to program managers. From a manufacturing perspective, there are three important trends: DoD downsizing, acquisition reform, and technology improvements. Reduced requirements equate to fewer production programs and severe reductions in those programs that do go forward. The effect is a potential loss in critical skills required of design teams in terms of designing for production, and less experience for production planning, scheduling, and controlling. Additionally, longer service lives and purchasing commercial off-the-shelf and nondevelopmental items as a poli-

cy initiative will mean more ACAT III programs with unique risks accompanied by the challenges of reduced functional support and smaller staffs.

Acquisition reform also brings new opportunities and challenges to the PM world. More simplified contracting actions, increased reliance on commercial specifications and standards, and less functional support bring significant opportunities to better integrate the NTIB and make more of it available to meet DoD requirements. This adds other unique challenges: What is a "Best Commercial Practice"? How good is it? Will the contractor's system meet my risk management needs?

Advances in information technology now enable the implementation of manufacturing management techniques in an affordable and effective manner. Some of the tools described in the following paragraphs (e.g., design of experiments) and producibility engineering and planning are easier to do with today's computers and software. Their widespread use can significantly reduce program risks.

#### **DSMC Manufacturing Management Curriculum**

We believe 80 percent of a manufacturing functional's job is influencing the design and getting ready for production; toward that end, all of our curriculum is designed to convey current DoD policies, regulations, and management tools related to manufacturing in defense acquisition. This philosophy is equally valuable in the two-week PMSC. Throughout the duration of the course, students will receive updates on the latest policies and initiatives impacting the manufacturing function. Additionally, students will be exposed to "Best Practices" being employed by world-class producers in both the defense and commercial facilities of the NTIB. Based on this material, we developed a set of questions any PM may want to ask of either the manufacturing functional or the development contractor.

The QFD "House of Quality" can be viewed as having two main parts. The first is the customer part, which is designed to allow customers to express needs in terms they understand. These needs usually are translated into a language the developer can use internally to describe and measure the item. For example, a customer requirement for a car door may be that it "closes easily." The developer might translate that requirement into energy measured in foot-pounds. The second part of the "House" is the technical information section in which at least one technical solution is described for each customer need. A possible technical solution in this case may involve the type of latching mechanism selected.

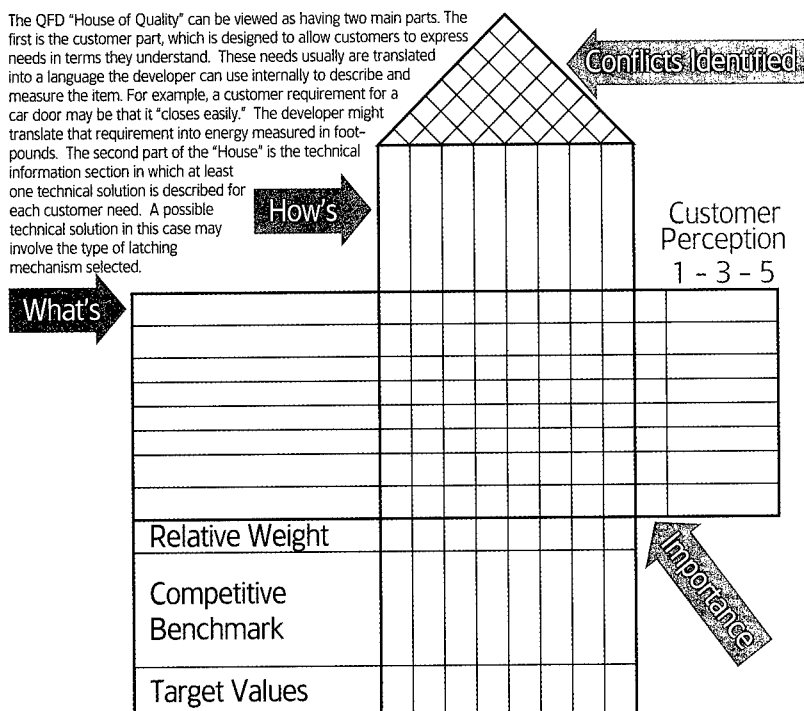


Figure 1. **House of Quality**

## Development Tools

As mentioned previously, we put a great deal of emphasis on the importance of influencing the design process for manufacturability. One way to do that is to implement Integrated Process and Product Development (IPPD), using Integrated Product Teams, or IPTs. Through the use of teams populated with appropriate functional area representatives who can concurrently perform required acquisition activities, IPPD attempts to optimize the development, production, and support processes.<sup>1</sup> The goal of IPTs is to make timely team decisions based on input from all functional areas (e.g., program management, engineering, and manufacturing), including customers and suppliers.

Currently, IPPD is working in the commercial marketplace as well as in the defense industry. At Chrysler, IPTs are called platform teams, and were used to develop the LH (mid-sized sedans) platform. Chrysler needed only 39 months versus the previous 54-month time frame for developing and launching the cars. The company used 740 engineers to

work on the LH cars, compared to the 2000 used on earlier platforms. The factory employees that produced the LH cars numbered just 3000 employees for full two-shift production, whereas earlier platforms needed as many as 5,300.<sup>2</sup>

## Smart Questions to Ask

The first logical question to ask is, "What engineering design tools used during development integrate manufacturing processes and affordability into the design?"

**Quality Function Deployment (QFD).** Programs in development face many risk drivers to cost, performance, and schedule. One of those drivers is customer requirements, especially when those requirements keep changing, are soft, or are not fully or adequately developed. A core development task is the gathering of requirements and the translation of these requirements into technical solutions.<sup>3</sup> As a planning process, QFD uses multifunctional teams to get the voice of the customer into the design specifications. User requirements and preferences are defined and categorized as user attributes, which are then

weighted based on importance to the user. Users are then asked to compare how their requirements are being met now by a fielded weapon system (or an alternative design approach) versus the new design. As a result, QFD provides the design team an understanding of customer desires (in clear text language), forces the customer to prioritize those desires, and compares/benchmarks one design approach against another. Each customer attribute is then satisfied by at least one technical solution. Values for those technical solutions are determined, and again rated among competing designs.

Finally, the technical solutions are evaluated against each other to identify conflicts. A convenient form for viewing the ultimate product is the "house of quality" (Figure 1), which should help the design team translate customer attribute information into firm operating or engineering goals, and identify key manufacturing characteristics.

**Design for "X".** The term "DFX" refers to a series of design approaches to achieve specific design-build objectives. Included in DFX are examples such as Design for Manufacture and Assembly (DFMA) and Design for Recycling (DFR). The first example, DFMA, focuses specifically on defining product design options for ease of fabrication and assembly. The goal is to integrate the manufacturing engineer's knowledge of the factory floor (i.e., manufacturing processes), along with the use of design principles and rules, to develop a more producible product. Examples of the design rules include minimizing part count, using standard components, designing parts for ease of fabrication, and avoiding separate fasteners. Also, DFMA can provide secondary benefits by increasing reliability, reducing inventory, and shortening product development cycle time. The second example, DFR, focuses specifically on achieving an optimization of recycling and reuse of materials at the end of a product's life cycle.

**Design of Experiments (DOE).** Many factors affect the quality of the end item. If our goal is to design and build quality into our products, we must control those factors that have the greatest impact on fit, performance, and service life. Most experimentation done today on the factory floor occurs by accident; i.e., manufacturing personnel first turn one knob (speed) up, and another knob (temperature) down in an attempt to bring product quality in line with specification requirements. They often change several factors at the same time and fail to collect or analyze data. They are not documenting and understanding the process; they are merely tampering with the system. Therein lies the benefit of DOE, which provides a structured way to characterize processes. A multifunctional team analyzes a process and identifies key characteristics, or factors that most impact the quality of the end item. Using DOE, the team runs a limited number of tests, and data are collected and analyzed. The results will indicate which factors contribute the most to end item quality, and will also define the parameter settings for those factors. Now, rather than tweaking or tampering with the system, production managers have the profound knowledge of their factory floor processes, which allow them to build quality in, starting at the earliest stages of design.

*How will management determine that equitable requirements tradeoffs are made between design and manufacturing processes during development?*

The answer to this question will vary based on the phase of the acquisition program. At Preliminary Design Review for instance, our contractor should provide evidence of performing producibility analyses on development hardware trading-off design requirements against manufacturing risk, cost, production volume, and existing capability/availability. Production planning demos should address material and component selection, preliminary production sequencing methods and flows concepts, new

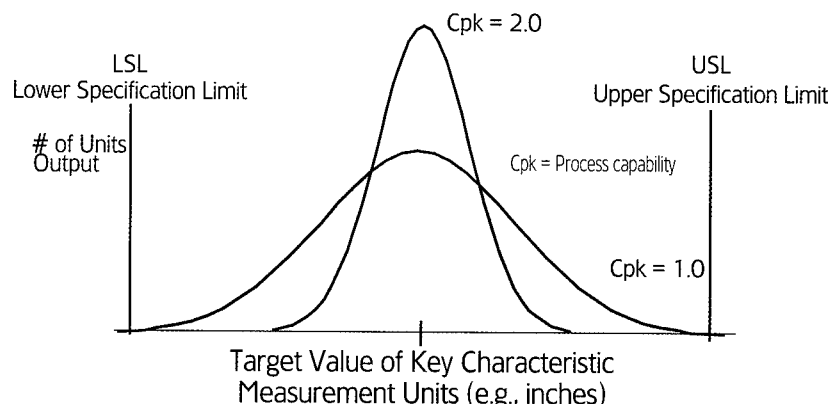
**Many factors affect the quality of the end item. If our goal is to design and build quality into our products, we must control those factors that have the greatest impact on fit, performance, and service life.**

processes, manufacturing risk, facility/equipment usage for intended rates and quantities, and acceptance test and inspection concepts.

Cost as an independent variable requires increased focus on cost as an input to the design process. Design-to-cost goals should be established with the help of the manufacturing IPT. For example, an air superiority fighter program has a design-to-cost goal based on previous fighter programs, where 32 percent of life cycle costs are consumed in production. The manufacturing IPT's goal would be to reduce that number by some portion (e.g., 4 percent) while not penalizing Operations and Support or Research and Development costs.

*Of those manufacturing processes which do not exist or are unproved, what is planned to prove them out?*

The primary way of doing this is by comparing program needs to work being done under the DoD's Manufacturing Science and Technology Program. The objective of this program is to develop or improve manufacturing processes, techniques, materials, and equipment to provide timely, reliable, and economical production of defense systems. Another way is to monitor



Variation is the silent killer on the factory floor, because it can significantly impact product quality. Process capability (Cpk) is a unit-less measure of product quality based on the normal distribution of product output around the nominal or target value. (Note: Process capability calculations can be made for other than normal distributions.)

Both processes are within specification limits. But minimizing variation, especially for key characteristics, is usually beneficial. Problems that occur with products falling in the cross-hatched areas include: degraded performance, increased support costs, and higher product rework rates.

Figure 2. **Reducing Variation**

service laboratories' technology investment plans and technology area planning. In either case, the goal is to ensure advanced manufacturing technologies are being considered by the contractor, the government, preferably both. As advanced technologies are integrated into manufacturing planning, process proofing should be demonstrated in a factory representative environment before rate production begins.

## Quality Systems

As noted previously, DoD has relied in the past on specifications and standards to promote competition and to ensure high quality products or processes. Specifications and standards were easy to use and put on contract, and also eased the source selection process because buyers (especially for numerous low-cost, commercially available items) could focus on cost versus quality. With today's emphasis on performance specifications and commercial standards, the PM's best way to influence product quality is through implementation of a quality system.

*How does the contractor plan to implement process control?*

Implementation of a quality system is the best way to control processes. Elements of a basic quality system (e.g., ISO 9000) that contribute to process control include corrective and preventive actions, training, calibration of measurement and test equipment, nonconforming product control, control of purchased materials and components, use of statistical techniques, and use of internal audits.

*I want to go beyond ISO 9000 to manage the risk on my program. What advanced quality concepts should I pursue?*

Many of the tools and techniques already addressed would contribute to advanced quality. Another is the concept of Key Product Characteristics (KPC). Identifying KPCs and their design limits, followed by identification of key production processes and

their capabilities are engineering tasks that support manufacturing development. The intent is to: identify design characteristics that most influence performance, supportability, and cost (see the QFD discussion above); determine and verify the capability of the production processes that effectively and affordably meet the mission requirements; and develop production process control techniques.

Product variation is the silent killer on the factory floor. As KPCs vary from nominal, losses occur usually in the form of scrap, rework, or repair; if products are fielded, then losses include degraded performance, lower reliability, and increased support costs, or upset customers. Once KPCs are identified, associated key processes can be evaluated for affordable maximization of process capability or Cpk (Figure 2). This implies further that a Process Control Plan be developed which ensures that required product quality is achieved at the lowest possible cost. Process Control Plans include the use of process control charts, statistical process control to differentiate common from special causes of variation, and gauge variation studies to minimize errors in measurement.

*How will development hardware be used to demonstrate fabrication, assembly, test and production processes?*

Development hardware, while usually used to examine initial compliance with specifications, should also be used to demonstrate manufacturing processes. At this stage in the acquisition life cycle (typically Product Definition and Risk Reduction or early Engineering and Manufacturing Development Phase), manufacturing processes can be characterized as:

- **Existing and Capable.** Indicates little work is needed since quality requirements can be met by current manufacturing techniques.
- **Existing But Not Capable.** Indicates the manufacturing process may be known, but not fully capable of meeting program rate, quality, or

performance goals. This presents risk to the program; a plan needs to be developed to mature this technology, find a suitable alternative, or perhaps both.

- **Nonexistent.** Development hardware was produced using techniques not transferable to the factory floor. This presents significant risk to the program; a plan needs to be developed to develop this technology, find a suitable alternative, or perhaps both.

*How can continuous process improvement be incentivized?*

One way is to use award fees based on reductions in the variance of KPCs, i.e., increase Cpk's, without increasing costs of the end item/component. Another method is to use award fees or a savings sharing plan based on reduction in process costs that do not sacrifice performance or schedule.

## Future Installments

In this article we have looked at systemic changes in the acquisition environment that may impact defense manufacturing in particular. We started at the earliest stages of design, and described some of the tools available to the manufacturing functional to make that design more producible. In the quality section we covered some advanced quality tools, and saw again that a quality product in the end starts with the design.

In the second installment of this series, we will look at lean as well as "green" manufacturing. See you then!

## END NOTES

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2. Ingrassia, Paul and Joseph B. White, "Shifting Gears," *America West Airlines Magazine*, November 1994, p.52.
3. Lang, James D. and Paul B. Hugge, "Lean Manufacturing for Lean Times," *Aerospace America*, May 1995, p.28.

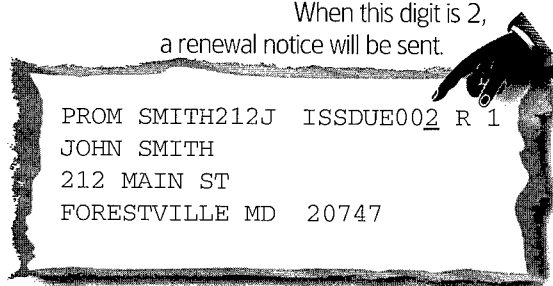
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## Keep A Good Thing Coming

# Pentagon Celebrates Roll-out of New 5000 Series Regulations

## OSD Senior Leaders Honor Acquisition Working Group Members, IPTs/WIPTs at Pentagon Awards Ceremony

COLLIE J. JOHNSON

**A** Pentagon awards ceremony conducted on May 3 brought out some of the best and brightest throughout the DoD professional acquisition community. It was an occasion for celebration — a time to reward not only those who had worked so diligently and selflessly to revise the complex, cumbersome 5000 Series, but to also recognize the Integrated Product Teams and Working Integrated Product Teams (IPT/WIPT). The teams who, despite many unknowns and variables, withstood the courage of their convictions, stood first in the “line of fire,” and are actively involved in incorporating the new processes brought about by acquisition reform into their day-to-day program management activities. Judging from the results, they are leading the way — with a degree of success that is not only meeting, but exceeding all expectations.

By his presence at the ceremony Secretary of Defense William J. Perry clearly signified his support and confidence in the new 5000 Series revisions, the originators, and those senior acquisition workforce leaders charged with implementing the new policies, procedures, and strategies throughout the entire DoD professional acquisition workforce.

### Dr. Kaminski's Remarks

As Master of Ceremonies, Mr. Irv Blickstein, Director of Acquisition Program Integration, introduced Dr. Paul

*Johnson is the Managing Editor, Program Manager, DSMC Press.*

G. Kaminski, Under Secretary of Defense (Acquisition & Technology), as the first speaker. Kaminski prefaced his remarks by first recognizing his Deputy Under Secretary of Defense for Acquisition Reform, Mrs. Colleen Preston, who he acknowledged as: “...an exceptional motivator and tenacious reformer — and I underline tenacious *three times*. Colleen has been instru-

Dorn, Under Secretary of Defense (Personnel & Readiness); Sheila Widnall, Secretary of the Air Force; the Component Acquisition Executives; Philip Coyle, Director of Operational Test and Evaluation; Emmett Paige, Jr., Assistant Secretary of Defense (C<sup>3</sup>I); as well as other distinguished leaders from OSD and the Defense Agencies.



FROM LEFT: DEPUTY UNDER SECRETARY OF DEFENSE (ACQUISITION REFORM) COLLEEN PRESTON SPEAKS WITH DSMC COMMANDANT BRIG. GEN. RICHARD A. BLACK, USA, PRIOR TO THE START OF THE AWARDS PRESENTATIONS. RECOGNIZING MRS. PRESTON'S LEADERSHIP IN SPEARHEADING ACQUISITION REFORM, KAMINSKI CALLED HER THE "ABSOLUTE DRIVING FORCE BEHIND THE SUCCESS WE [THE PROFESSIONAL ACQUISITION WORKFORCE] ARE CELEBRATING TODAY."

mental in working with the Congress on reform legislation and implementing a major paradigm shift within DoD."

Kaminski also acknowledged other senior officials in attendance: Edwin

"Today," said Kaminski, "we are celebrating the success of the Department's acquisition reform initiatives. Specifically, we are celebrating the approval of the new DoD 5000 Series, which institutionalizes fundamental



**“...Today  
marks the  
end of the  
beginning.”**

**—Winston Churchill**

change in the defense acquisition process. And we are also celebrating the hallmark of our new way of doing business — the Integrated Product Team, or IPT.” He reaffirmed that acquisition reform remains a top priority of this administration...of vital importance for three specific reasons:

First, it allows the United States to maintain its technological superiority through a strong national industrial base. Acquisition reform allows DoD to take full advantage of the procurement of commercial items to meet its requirements. This means that the Department can rely on a larger industrial base to meet critical requirements.

Second, it gives the Department an opportunity to reduce acquisition costs through the adoption of business practices characteristic of world-class suppliers. Study after study has documented the high costs associated with the Department’s acquisition process. Acquisition reform is helping us dismantle this high-cost system and helping the Pentagon become a smart buyer.

And third, acquisition reform helps the warfighter. It helps our troops by getting weapons and equipment fielded faster, cheaper, and at promised performance levels. It also helps by freeing up scarce resources that can be reinvested to meet critical modernization needs.

Concluding his introductory remarks Kaminski reminded the audience that our main objective today is to recognize the key contributions of certain individuals and groups within the Department who have worked long

and hard to make acquisition reform a reality. “That is why we are holding this ceremony this morning — to recognize and celebrate this hard work that is paying off so handsomely.”

He also took the opportunity to remind the audience of the importance of Acquisition Reform Day on May 31, emphasizing that “AR Day” allowed the acquisition community to communicate in three directions: (1) from the top down, as the Department’s leadership reaffirmed the significance of acquisition reform; (2) laterally, as all members of the Department’s acquisition family share their successes and best practices with peers; and (3) from the bottom up, as the Department’s “rank and file” acquisition workers communicated good ideas for improving acquisition processes.

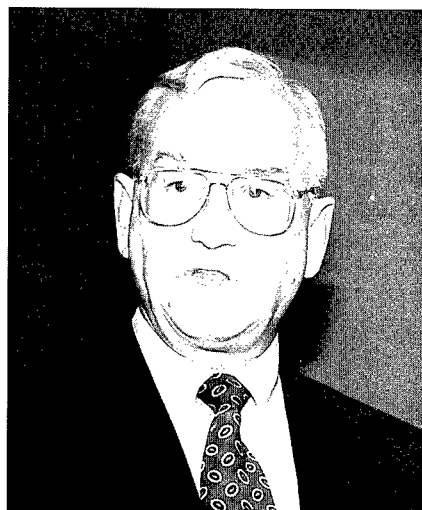
#### **Packard Award Presentations - Secretary of Defense Perry**

Secretary of Defense William J. Perry, keynote speaker for the celebration, captured the spirit and enthusiasm of the occasion: “This is an historic achievement, and you are the unsung heroes of that achievement. And it’s better to be a sung hero than an unsung hero; and so we’re going to do some singing about it today.”

Giving credit where credit was due, Perry told the audience that in spite of skepticism, and in the face of all evidence to the contrary that acquisition reform simply couldn’t be done, he was happy to report that we’re all here to celebrate the teams who proved the naysayers wrong, reflecting that “They just went out and did it. Today we’re going to honor some of those people. So many people said it couldn’t be done, and you have done it. And we’re here to say thank you and to thank you in the most concrete way we know how.”

#### **“David Packard Excellence in Acquisition” Award Team Winners**

Joined by Kaminski and the Principal Deputy Under Secretary of Defense



UNDER SECRETARY OF DEFENSE (ACQUISITION & TECHNOLOGY) PAUL G. KAMINSKI PROVIDED THE OPENING REMARKS FOR THE ROLL-OUT/CELEBRATION OF THE NEW 5000 SERIES REGULATIONS AT A PENTAGON CEREMONY ON MAY 3.

(Acquisition & Technology) R. Noel Longuemare, Perry announced the selection of six teams to receive the first ever “David Packard Excellence in Acquisition” Awards. “These teams,” according to Perry, “actually did it...actually reformed the acquisition bought by our new procedures, and bought much more efficiently and much more effectively.”

Explaining the origin of the Packard Award, Perry had this to say: “This award, of course, is named for the late Dave Packard...a great American...a great friend of mine. He pioneered acquisition reform back in the days when I thought it was too hard to do. While I had it in the pile of something that was too difficult — you could dream about but it was not worth the time and effort to do it — he was trying to do it.

When he was a Deputy Secretary of Defense in the ‘70s, he initiated the first really serious efforts in acquisition reform. And then during the ‘80s, he was made the Chairman of the Packard Commission.

And as the Chairman of the Packard Commission he recruited a young man from California, namely me, to come back and head up the acquisition



SECRETARY OF DEFENSE WILLIAM J. PERRY  
PRESIDED OVER THE PRESENTATION OF THE FIRST  
EVER "DAVID PACKARD EXCELLENCE IN ACQUISITION"  
AWARDS, PRESENTED TO SIX INTEGRATED PRODUCT  
TEAMS/WORKING INTEGRATED PRODUCT TEAMS.

reform sub-panel of the Packard Commission. And that was another impetus toward acquisition reform. But the real impetus to acquisition reform came from you — Packard gave us something to build on, but the building was done by the teams sitting in front of me today, and I thank you for that."

### **Packard Team Awards**

**Department of the Army, Secure Mobile Anti-Jam Reliable Tactical Terminal, SMART-T, Integrated Product Team:** In recognition of acquisition excellence and superior performance in introducing the full spectrum of DoD acquisition streamlining initiatives to the management of SMART-T, assuring that this mobile tactical communication system is the premier next generation satellite communication system for echelons (at corps and below).

**Department of the Navy New Attack Submarine Command, Control, Communications and Intelligence System Integrated Product Team:** In recognition of acquisition excellence and superior performance in developing an acquisition strategy that incorporates acquisition reform objectives to satisfy technical affordability and industrial base objectives. The accomplishments of this IPT will result in the development of the most capable

combat system at the most affordable cost. (See March/April 1996 *Program Manager*, pp. 38-41.)

**Department of the Air Force Request for Proposals Integrated Team:** In recognition of acquisition excellence and superior performance in rapidly deploying acquisition reform initiatives, introducing streamlining measures into acquisition products and processes, educating the acquisition workforce in new techniques, and improving the government-industry relationship thus allowing for more efficient management of resources throughout the U.S. Air Force.

**Ballistic Missile Defense Organization's Medium Extended Air Defense System (MEADS) Integrated Product Team:** In recognition of acquisition excellence and superior performance in developing, coordinating, and executing the MEADS program. This is a critical joint multinational effort designed to seek economies in the use of national resources to improve the point defense of vital assets and maneuver forces and for use against the ever-increasing threat in the field of tactical ballistic and cruise missiles.

**Defense Logistics Agency Material Management Integrated Product Team:** In recognition of acquisition excellence and superior performance in managing inventory control points through innovation and the use of best commercial practices to reduce operating and investment costs, achieve cohesive productivity improvements, and improve response to customer requirements. The empowered Material Management IPT is integrating the skills of its procurement, supply, and engineering specialists in revitalizing and reconstructing the commodities business.

**U.S. Special Operations Command Directional Infrared Countermeasures Integrated Product Team:** In recognition of acquisition excellence and superior performance in creatively managing and effectively streamlining directional infrared countermeasures, a complex and challenging interna-

tional cooperative acquisition program between the United States Department of Defense and the United Kingdom Ministry of Defence. The IPT applied expertise to the program from a variety of government and industrial organizations in achieving critical and time-sensitive objectives. (See May/June 1996 *Program Manager*, pp. 10-14.)

Upon presentation of the last team Packard award, Kaminski commented on the significance of two of the award winners' involvement in international programs. "That was not any contrivance," he stated. "It is merely by happenstance that those issues involved international programs, something that you all know has been a key priority for both the Secretary and me."

### **5000 Series Working Group Award Winners**

The next category of award winners was targeted at the 5000 Series Working Group members involved in the rewrite effort which, according to Kaminski, was "an excellent example of what our integrated teams can achieve...in record time and record performance." Relating some of the background behind the rewrite effort, Kaminski reviewed the impetus and history behind the rewrite.

"On March 15th of '96 Secretary of Defense William Perry approved an historic restructuring of our defense acquisition policies and procedures. The new policy and procedures, which are contained in DoD Directive 5000.1 and in DoD Regulation 5000.2, represent *dramatic* change in almost every major aspect of the way the Pentagon has traditionally done its business.

Commercial practices and products," he continued, "are given special emphasis. Cost is treated as an independent variable rather than as some byproduct outcome of our decision process. Program managers and other acquisition personnel are being empowered to use and apply their professional judgment.

Over 30 separate policy memos and report formats have now been can-



AMONG THOSE ATTENDING THE CEREMONY WERE FROM LEFT: PRINCIPAL DEPUTY UNDER SECRETARY OF DEFENSE (ACQUISITION & TECHNOLOGY) R. NOEL LONGUEMARE; SHEILA WIDNALL, SECRETARY OF THE AIR FORCE; AND EDWIN DORN, UNDER SECRETARY OF DEFENSE (PERSONNEL & READINESS).

celed, and the new policy documents themselves are almost 90 percent shorter than those that they replaced. These new documents are key to institutionalizing fundamental change in our defense acquisition process, and they are a visible symbol of the Department's acquisition reform efforts."

Assisting Kaminski in presenting the Working Group Awards were Philip E. Coyle III, Director, Operational Test and Evaluation; and Emmett Paige, Jr., Assistant Secretary of Defense (C<sup>3</sup>I). (All Working Group award presentations covered the period January 1995 through March 1996.)

**Secretary of Defense Meritorious Civilian Service Award:** Presented to five acquisition workforce professionals for their work in institutionalizing one of the most significant changes that the Department has undertaken in recent years — that of rewriting the basic acquisition policies for the Department. Their contributions included developing, writing, and publishing *The Rules of The Road* instruction manual for the conduct of integrated product teams; establishing and conducting the DoD 5000 rewrite working group; integrating the acquisition guidance for both weapon systems and automated information systems; and presenting DoD

5000 decision briefings to senior Department officials, leading to publication of a significantly reduced Department of Defense directive. Each also contributed unique leadership capabilities to the organizations from which they came.

**Secretary of Defense Exceptional Civilian Service Award:** Presented to five professional acquisition workforce members for their efforts at teaming with other key leaders in rewriting the basic acquisition document for the Department. Their contributions were particularly significant in that they made use of their expertise in specific areas of acquisition in drafting portions of the new document. Additionally, they adjudicated nearly 2,500 significant or minor comments that arose during the review process.

**Secretary of Defense Award for Excellence:** Presented to four acquisition workforce professionals for contributions on behalf of their parent organizations, which significantly contributed to the working group's understanding of acquisition streamlining at the working level. Their efforts and accomplishments meant that the rewritten document could be more readily embraced by their Service or Agency.

**Certificate of Recognition:** Presented to eight acquisition workforce professionals for outstanding achievement in institutionalizing fundamental change in the Department of Defense acquisition process as members of the 5000 Working Group. Codifying the acquisition reform process through the rewrite of the 5000 Series documents was a monumental undertaking. Operating as an integrated product team they successfully achieved the objectives established for the rewrite effort.

**Letter of Appreciation:** Presented to 20 acquisition workforce professionals for their important contributions as members of the 5000 Working Group. The expertise and knowledge they brought to this team effort enabled the rewrite of the 5000 Series documents to be an expeditious process yielding a quality product that will further our acquisition reform efforts. Their participation on the 5000 Series Working Group as an empowered representative of their Service or Agency was extremely critical to the success of this enterprise. In addition, this experience had benchmarked the high level of accomplishment that an IPT can provide in achieving a stated task.

## In Conclusion

Kaminski concluded the ceremony by acknowledging the hard work of Irv Blickstein and Dan Dunmire in coordinating the preparations for all aspects of the day's events. Expressing his pride and appreciation at the opportunity to host the 5000 Series Celebration, Kaminski stated that, "This has been I think a great day for defense acquisition. I want to thank all of you again for all of your very, very hard work in support of acquisition reform." Leaving the audience with one last thought, he commented:

I would go back to Winston Churchill to remind you this is not the end of our work in acquisition reform nor even the beginning of the end. I do think, though, that *today marks the end of the beginning.*

# PENTAGON DOD 5000 SERIES

## Integrated Product Team/Work



LEFT: SECRETARY OF DEFENSE WILLIAM J. PERRY IS INTRODUCED BY UNDER SECRETARY OF DEFENSE (ACQUISITION & TECHNOLOGY) PAUL G. KAMINSKI PRIOR TO PERRY'S PRESENTATION OF THE "DAVID PACKARD EXCELLENCE IN ACQUISITION" TEAM AWARDS.

Photo by Richard Mattox



DEPARTMENT OF THE ARMY, SECURITY MOBILE ANTI-JAM RELIABLE TACTIC TERMINAL, SMART-T, INTEGRATED PRODUCT TEAM.



BALLISTIC MISSILE DEFENSE ORGANIZATION'S MEDIUM EXTENDED AIR DEFENSE SYSTEM (MEADS) INTEGRATED PRODUCT TEAM.



DEFENSE LOGISTICS AGENCY MATERIAL MANAGEMENT INTEGRATED PRODUCT TEAM.

# ROLL-OUT - MAY 3, 1996

## Integrated Product Team Winners



U.S. SPECIAL OPERATIONS COMMAND DIRECTIONAL INFRARED COUNTER-  
MEASURES INTEGRATED PRODUCT TEAM.



DEPARTMENT OF THE NAVY NEW  
ATTACK SUBMARINE COMMAND,  
CONTROL, COMMUNICATIONS AND  
INTELLIGENCE SYSTEM INTEGRATED  
PRODUCT TEAM.



DEPARTMENT OF THE AIR FORCE REQUEST FOR PROPOSALS INTEGRATED  
TEAM.

# PENTAGON DOD 5000 SERIES

## Acquisition Working Group



SECRETARY OF DEFENSE MERITORIOUS CIVILIAN SERVICE AWARD WINNERS. PRESENTED FOR THEIR WORK IN INSTITUTIONALIZING ONE OF THE MOST SIGNIFICANT CHANGES THAT THE DEPARTMENT HAS UNDERTAKEN IN RECENT YEARS — THAT OF REWRITING THE BASIC ACQUISITION POLICIES FOR THE DEPARTMENT.

SECRETARY OF DEFENSE AWARD FOR EXCELLENCE WINNERS. PRESENTED FOR CONTRIBUTIONS ON BEHALF OF THEIR PARENT ORGANIZATIONS, WHICH SIGNIFICANTLY CONTRIBUTED TO THE WORKING GROUP'S UNDERSTANDING OF ACQUISITION STREAMLINING AT THE WORKING LEVEL.



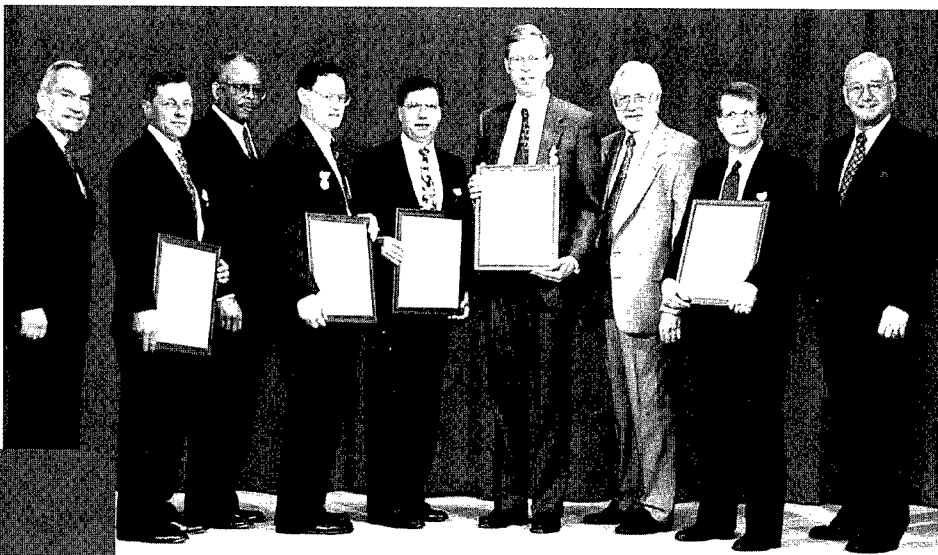
OVER 20 MEMBERS OF THE ACQUISITION WORKING GROUP WERE PRESENTED LETTERS OF APPRECIATION FOR THEIR IMPORTANT CONTRIBUTIONS AS MEMBERS OF THE 5000 SERIES ACQUISITION WORKING GROUP. AMONG THEM WAS PROFESSOR CHUCK COCHRANE, FACULTY DEPARTMENT CHAIR, ACQUISITION POLICY DEPARTMENT, DSMC. FROM LEFT: DSMC COMMANDANT BRIG. GEN. RICHARD A. BLACK, USA; COCHRANE; UNDER SECRETARY OF DEFENSE (ACQUISITION & TECHNOLOGY) PAUL G. KAMINSKI.

Photo by Richard Matto



# S ROLL-OUT - MAY 3, 1996

## Winners



SECRETARY OF DEFENSE EXCEPTIONAL CIVILIAN SERVICE AWARD WINNERS. PRESENTED FOR THEIR EFFORTS AT TEAMING WITH OTHER KEY LEADERS IN REWRITING THE BASIC ACQUISITION DOCUMENT FOR THE DEPARTMENT.

CERTIFICATE OF RECOGNITION WINNERS. PRESENTED FOR OUTSTANDING ACHIEVEMENT IN INSTITUTIONALIZING FUNDAMENTAL CHANGE IN THE DEPARTMENT OF DEFENSE ACQUISITION PROCESS AS MEMBERS OF THE 5000 WORKING GROUP.



# SECDEF Speaks At DoD 5000 Series Roll-out and Celebration

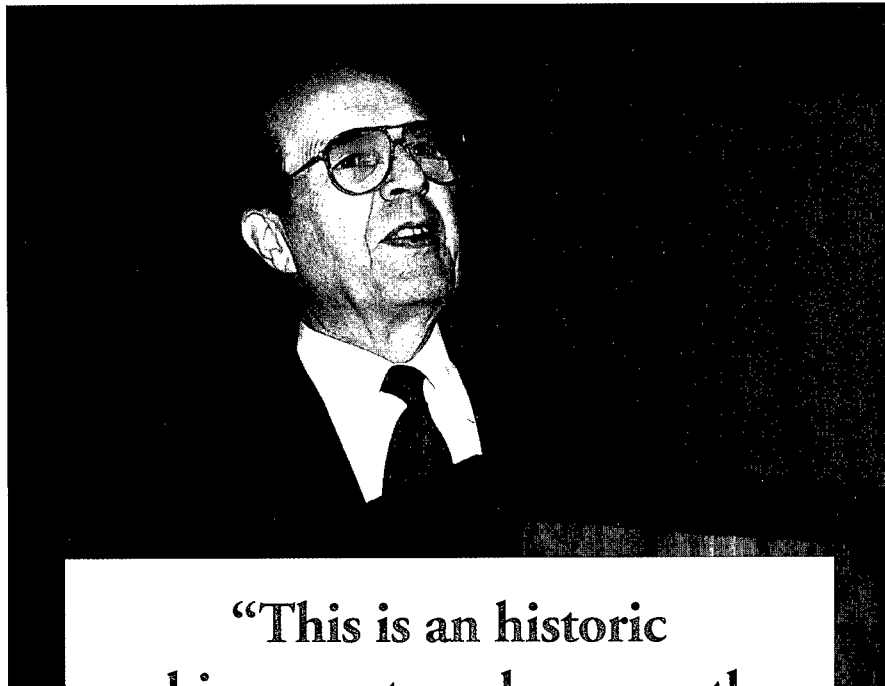
## Perry Lauds "Unsung Heroes" of Acquisition Reform

**Editor's Note:** The following remarks by Secretary of Defense William J. Perry at the Pentagon DoD 5000 Series Celebration held on May 3, 1996, are of across-the-board interest to the acquisition community at large. *Program Manager* is pleased to present his remarks in their entirety.

I have testified numerous times in Congress, both in defense of the '96 and the '97 budget. And when I talk about the budget, one of the primary things that I tell them is that the drawdown now is essentially over; for the first time in history we have conducted a drawdown successfully. And what I mean by "success," what I think is the major success, is that even though we have reduced the defense budget over the last seven or eight years about 40 percent, even though we've reduced the size of the military force about one-third, we have preserved the readiness and the capability of this force.

Indeed, we have the best military force in the world today. That sounds like a statement — a boasting statement. It is just a statement of fact.

I see that every time I go to visit one of our military bases in the United States or overseas. We all see it demonstrated every time we have a deployment: deployment to Haiti, deployment to Bosnia. Most recently, the small deployment to Liberia hardly makes



**"This is an historic achievement, and you are the unsung heroes of that achievement. And it's better to be a sung hero than an unsung hero; and so we're going to do some singing about it today."**

the newspapers because it is done so expertly. But we moved our forces a distance of about a few thousand miles in a few days to go to Liberia, and extricated 2,200 people from that

country safely without a single casualty...we had the resources, the professionalism, the training to execute a mission like that, and it's just in a day's work.



When I talk to Congress I also tell them about one of the casualties of preserving the readiness and the capability of our forces as our budget goes down is that we have dramatically decreased our modernization budget, and that over time, this can be a serious, long-term problem. That is, it can create a long-term readiness problem if we can't fix that.

And we have two ways of fixing it. The first way is within our budget: we free up dollars from infrastructure and move them into modernization. And the key to the success of that is our base closing program. As painful and as difficult as that has been, it is absolutely essential.

And I'll tell you what I've told Congress in my most recent testimony to them: that after years, literally years of closing bases and paying for closing bases — in our '94-'95 budget we had costs of several billion dollars for closing bases — in '96 for the first time we are to break even closing bases. That is, the cost of closing bases was offset by the savings from closing bases. Next year we will actually have a net savings of \$2 billion, and by the end of this decade we'll be up to \$4 or \$5 billion per year. And those are all funds which can be moved from infrastructure expenses to modernization. That's one way we're going to deal with the modernization problem.

The other way is acquisition reform, which means what we buy we buy more efficiently. For a given budget we can buy more weapons systems, and the key to that, of course, is our acquisition reform program.

For two years I testified to Congress how important that program was and what we were doing. But up until a few months ago, I was never able to put dollar savings on that. We hoped, we expected, we believed there were going to be dollar savings; we couldn't prove it. And now, just in the last three or four months, the results are starting to come in from the pilot programs we set up in acquisition reform. And the



**“We have the best military force in the world today. That sounds like a statement — a boasting statement. It is just a statement of fact.”**

savings that are being demonstrated are not 5 percent, are not 10 percent, but we're actually cutting in half, cutting to a third the cost of acquisition in the programs where we have fully implemented acquisition reform.

This is an historic achievement, and you are the unsung heroes of that achievement. And it's better to be a sung hero than an unsung hero; and so we're going to do some singing about it today.

All through my career, I have been confronted with people who have told

me that acquisition reform cannot be done. That you could write papers about it, you could do studies on it, you could do reorganizations to try to make it happen, but you were just shuffling paper around and shuffling people around, and in the long run it wouldn't make any difference. And I have to say that over the years I had come to sort of half believe those people, only because we did not have any concrete and serious counterexamples. Now the counterexamples are coming in, and now I think we're going to make some real believers out there.



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# SECDEF Recognizes Acquisition Reform Senior Leaders at Pentagon Awards Ceremony

## "Turning the Acquisition World on Its Head"

COLLIE J. JOHNSON

Secretary of Defense William J. Perry, in a Pentagon awards ceremony conducted on May 20, formally recognized the efforts of several key executives who have done so much to help the Department of Defense reform its acquisition process. From pilot programs, to legislation, to audit and oversight, the changes in the way the government acquires weapons systems to support the modern warfighter are monumental. Perry's presence at the ceremony symbolized the high priority he places on the acquisition reform effort.

### Take Care of Those Who Work for You

Introduced by Under Secretary of Defense for Acquisition and Technology Paul G. Kaminski, Perry prefaced his remarks with a quote from a leading business executive: "Take care of those who work for you, and you will float to greatness on their achievements." Referring to the DoD 5000 Series Roll-out Ceremony previously conducted at the Pentagon on May 3, which recognized key members of the Acquisition Working Group and outstanding Integrated Product Teams/Working Integrated Product Teams, Perry said, "Three weeks ago we honored the achievements of those who work for you, and today I want to honor those of you who have floated to greatness on those achievements."

### Turning the Acquisition World on Its Head

Perry told the assembled acquisition key executives that their leadership was "turning the acquisition world on its head. We used to dictate to the business world and shape its practices to fit ours. Today we are listening to the business world and shaping our practices to fit theirs. Many of our predecessors have talked about acquisition reform, but we are doing it. We know it can be done. We know it can save money, and we know that it's critical for modernization, which is critical to supporting our warfighters."

Perry went on to say that our challenge in the acquisition reform arena can best be described as *carpe diem*, the Latin phrase meaning "seize the day." The Department of Defense has done just that by designating May 31 as Acquisition Reform Acceleration Day. "It is not a day to stand down and reflect on problems; it's a day to sit up and make changes happen. We know the time is now ripe for making these changes."

### An Idea Whose Time Has Come

Perry stated that the President and the Vice President strongly support acquisition reform. Further, key Members of Congress support it and have passed enabling legislation. "The Deputy Secretary and I are both committed to the success of the acquisition reform program, and we have a superb acquisition team. Victor Hugo once said,

'More powerful than the tread of mighty armies is an idea whose time has come.' Well, acquisition reform is an idea whose time has come, and it is the key to our country being able to maintain its mighty Army, and Air Force, and Navy, and Marines."

### Colleen A. Preston

Perry's first award presentation went to Colleen A. Preston, Deputy Under Secretary of Defense for Acquisition Reform. Preston received the Bronze Palm to the Department of Defense Medal for Distinguished Public Service for exceptionally distinguished service as Deputy Under Secretary of Defense for Acquisition Reform, Office of the Under Secretary of Defense for Acquisition and Technology, from September 1995 to May 1996. According to the award citation, she "dramatically changed the way the Department of Defense procures goods and services from reducing workload of procurement personnel to leading the efforts to reform, streamline, and reengineer the acquisition processes to meet the needs of the nation's warfighters. She has made significant and lasting contributions to revolutionizing the Department's acquisition processes."

### Secretary of Defense Medal for Meritorious Civilian Service

Perry's second presentation was The Secretary of Defense Medal for Meritorious Civilian Service to five senior acquisition leaders: Eleanor R. Spector,

Johnson is Managing Editor, Program Manager, DSMC Press.

Continued on page 54

# SECDEF RECOGNIZES ACQUISITION REFORM SENIOR LEA

## "Turning the Acquisition World on

SECRETARY OF DEFENSE WILLIAM J. PERRY PRESENTS THE BRONZE PALM TO THE DEPARTMENT OF DEFENSE MEDAL FOR DISTINGUISHED PUBLIC SERVICE TO COLLEEN A. PRESTON, DEPUTY UNDER SECRETARY OF DEFENSE FOR ACQUISITION REFORM. PICTURED FROM LEFT: PERRY; MR. RAYMOND PRESTON; PRESTON; KAMINSKI.



PERRY PRESENTS THE SECRETARY OF DEFENSE MEDAL FOR MERITORIOUS CIVILIAN SERVICE TO ELEANOR R. SPECTOR, DIRECTOR OF DEFENSE PROCUREMENT. (SPECTOR'S AWARD WAS THE SILVER PALM SIGNIFYING A THIRD AWARD OF THIS HONOR.) PICTURED FROM LEFT: PERRY; SPECTOR; KAMINSKI.



PERRY PRESENTS THE DEFENSE SUPERIOR SERVICE MEDAL TO VICE ADM. WILLIAM C. BOWES, USN, FORMER SERVICE ACQUISITION EXECUTIVE AND ACTING ASSISTANT SECRETARY OF THE NAVY FOR RESEARCH, DEVELOPMENT, AND ACQUISITION. PICTURED FROM LEFT: PERRY; MRS. DEE BOWES; BOWES; KAMINSKI.

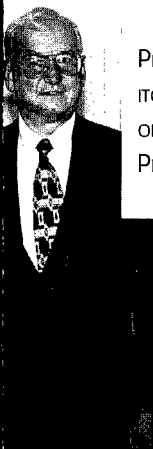


PERRY PRESENTS THE SECRETARY OF DEFENSE MEDAL FOR MERITORIOUS CIVILIAN SERVICE TO TERRY R. LITTLE, PROGRAM DIRECTOR, JOINT DIRECT ATTACK MUNITION. PICTURED FROM LEFT: PERRY; MRS. ELAINE LITTLE; LITTLE; MISS SHERRY LITTLE; KAMINSKI.



# RS AT PENTAGON AWARDS CEREMONY - MAY 20, 1996

## Its Head"



PERRY PRESENTS THE SECRETARY OF DEFENSE MEDAL FOR MERITORIOUS CIVILIAN SERVICE TO IRVING N. BLICKSTEIN, DIRECTOR OF ACQUISITION PROGRAM INTEGRATION. PICTURED FROM LEFT: PERRY; BLICKSTEIN; MRS. SYLVIA BLICKSTEIN; KAMINSKI.



PERRY PRESENTS THE SECRETARY OF DEFENSE MEDAL FOR MERITORIOUS CIVILIAN SERVICE TO ANTHONY M. VALLETTA, DEPUTY ASSISTANT SECRETARY OF DEFENSE (C3I). PICTURED FROM LEFT: PERRY; VALLETTA; KAMINSKI.



PERRY PRESENTS THE SECRETARY OF DEFENSE MEDAL FOR MERITORIOUS CIVILIAN SERVICE TO DARLEEN A. DRUYUN, FORMER ACTING ASSISTANT SECRETARY OF THE AIR FORCE FOR ACQUISITION. PICTURED FROM LEFT: PERRY; DRUYUN; KAMINSKI.



PERRY PRESENTS THE BRONZE PALM TO THE DEPARTMENT OF DEFENSE MEDAL FOR DISTINGUISHED PUBLIC SERVICE TO PRINCIPAL DEPUTY UNDER SECRETARY OF DEFENSE FOR ACQUISITION AND TECHNOLOGY R. NOEL LONGUEMARE. PICTURED FROM LEFT: PERRY; MRS. JULIE LONGUEMARE; LONGUEMARE; KAMINSKI.



PERRY PRESENTS THE DEPARTMENT OF DEFENSE MEDAL FOR DISTINGUISHED PUBLIC SERVICE TO UNDER SECRETARY OF DEFENSE FOR ACQUISITION AND TECHNOLOGY PAUL G. KAMINSKI. PICTURED FROM LEFT: PERRY; MRS. JULIE KAMINSKI; KAMINSKI.

Director of Defense Procurement (Spector's award was the Silver Palm signifying a third award of this honor); Irving N. Blickstein, Director of Acquisition Program Integration; Anthony M. Valletta, Deputy Assistant Secretary of Defense (C3I); Darleen A. Druyun, former Acting Assistant Secretary of the Air Force for Acquisition; and Terry R. Little, Program Director, Joint Direct Attack Munition.

A single citation was read for the entire group: "For exceptionally meritorious civilian service in the Office of the Under Secretary of Defense for Acquisition and Technology; the Assistant Secretary of Defense for Command Control, Communications and Intelligence; and the Department of the Air Force. These individuals have made significant contributions in the areas of contracting and acquisition strategy improvements; institutionalization of significant management changes in the Department, including rewriting the Basic Acquisition Policies and Procedures; managing acquisition oversight through the use of integrated product teams; implementing acquisition reform by originating the Air Force Lightning Bolt initiatives; and by implementing best commercial practices, integrated product development and streamlined acquisition principles in major joint weapon development programs."

#### **Vice Adm. William C. Bowes, USN**

Perry's next presentation was The Defense Superior Service Medal, awarded to Vice Adm. William C. Bowes, USN, Senior Acquisition Executive and Acting Assistant Secretary of the Navy for Research, Development, and Acquisition from May 15 to October 31, 1995. "Adm. Bowes brought an extraordinary combination of personal integrity, operational and professional acquisition knowledge, and a visionary approach to the Navy's most senior acquisition position. His visions of government and industry teams, an empowered workforce, and value-added acquisition processes laid the

groundwork for the Navy of the 21st Century."

#### **"The End of the Beginning"**

At the conclusion of the presentations by Perry, Kaminski took the podium and spoke of the difficulties in implementing real acquisition reform. "Many different teams in the past have started the process of acquisition reform. I think the real difference in results I can attribute largely to the team assembled here who have worked diligently to make it happen." Borrowing a quote from Winston Churchill, Kaminski said, "This is not the end. It's not even the beginning of the end. But I think we are at *the end of the beginning* of acquisition reform. There is a foundation now in place today as a result of this wonderful team of people who have pulled and harnessed together to make this happen."

#### **R. Noel Longuemare**

In a unexpected announcement, Kaminski referred to another invaluable member of his staff he wished to recognize: "This ceremony wouldn't be complete without recognizing one other individual who has been so key to this effort, and that's my Principal Deputy Under Secretary of Defense for Acquisition and Technology, R. Noel Longuemare." Mrs. Julie Longuemare, in a surprise appearance, joined Perry and Kaminski at the podium to honor her husband. Perry then presented Longuemare with The Bronze Palm to the Department of Defense Medal for Distinguished Public Service for exceptionally distinguished service as Principal Deputy Under Secretary of Defense for Acquisition and Technology from June 1995 to April 1996.

"Mr. Longuemare championed a massive reduction of mandatory military specifications and standards, forcing both industry and government to consider the best technical solutions for current acquisition challenges. Also, he championed innovative acquisition concepts including cost as an independent variable and the single process initiative, which represent benchmark thinking for cost reduction, quality

improvement, and industrial competitiveness. He set the example for constructive communication as a community standard, fostering improved coordination between the Defense and Service staffs, particularly the requirements definition process."

#### **Paul G. Kaminski**

Not to be outdone, Perry had an unexpected finale to the awards ceremony. Joined by Mrs. Julie Kaminski whose presence was a surprise, he presented The Department of Defense Medal for Distinguished Public Service to Paul G. Kaminski for exceptionally distinguished service as the Under Secretary of Defense for Acquisition and Technology from October 1994 to May 1996.

"Dr. Kaminski's inspiring leadership, extensive knowledge, and dedication to purpose were instrumental in the unprecedented successes of the Department of Defense's efforts to reengineer and streamline the acquisition process. Throughout this period he continually demonstrated an unequaled mastery for leading organizational change by empowering the acquisition workforce to explore better, faster, and more cost-effective ways of doing business."

#### **"People Often Stumble Over the Truth"**

Adding his own Winston Churchill quote to the day's events, Perry remarked: "People often stumble over the truth, but most pick themselves up and hurry away without being affected by it. Paul Kaminski, along with others of us, has stumbled over the truth that acquisition reform is a necessity for this Department. But Paul has not hurried away without being affected by it. He has taken that truth and manifested his effort to try to make a reality of the most effective program in acquisition reform that this Department has ever seen. I think the Department owes you, Paul, a very special vote of thanks as the leader of this absolutely first-class acquisition team that was assembled here today, and I'd like to take this occasion to offer my thanks."

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# Test & Evaluation Policy Changes in New DoD 5000 Series

## Significant Changes That Impact Planning & Execution of Test & Evaluation

LT. COL. EDWARD JONES, USA

**O**n March 15, 1996, Secretary of Defense William J. Perry approved the release of DoD Directive 5000.1 and DoD Regulation 5000.2-R for immediate implementation. Do not panic! Unless directed by the Milestone Decision Authority, program documentation approved prior to March 15, 1996, need not be revised for the sole reason of satisfying the new requirements that are specified in DoD Regulation 5000.2-R. New programs must implement the revised guidance. Wise program and test managers will incorporate the new guidance, when appropriate, as program documentation is routinely updated or revised because of program changes.

This article summarizes the most significant changes that impact the planning and execution of test and evaluation for major defense acquisition programs and for major automated information system acquisition programs. Follow-on articles can address the potential impacts (good and bad) on the planning and execution of a test and evaluation strategy for major defense acquisition programs or major automated information system acquisition programs.

### Guiding Principles and Mandatory Procedures

DoD Directive 5000.1 provides guiding principles, while DoD 5000.2-R specifies mandatory procedures. When specifically stated in legislation

or when placed on the Office of the Secretary of Defense oversight list, specified mandatory procedures in DoD Regulation 5000.2-R may also apply to less-than-major programs. For example, legislation mandates live-fire testing for covered systems, major munitions, or missile programs, as well as related covered product improvements. Some of these systems may be non-major programs such as an Acquisition Category III (ACAT III) missile program. Figure 1 summarizes requirements, as extracted from DoD Regulation 5000.2-R, for test and evaluation by ACAT.

### Key Policy Changes

It is important to note that the major requirements concerning test and evaluation for major defense acquisition programs are essentially the same as previously prescribed in the old DoD 5000 series. One noticeable difference is that TEMP's are no longer mandated for all acquisition programs. Without further study, a test manager for a weapon system that is a major defense acquisition program might conclude that the revised DoD 5000 series requires little or no change in the planning and execution of test and evaluation. The test and program managers for major automated information system acquisition programs will probably consider the requirement for ACAT IA programs to have an approved Operational Requirements Document (ORD) in the format as prescribed in Appendix II of DoD Reg-

ulation 5000.2-R, to be a very significant change. The major automated information system manager may also have some concerns in using a TEMP format that applies equally to weapon and automated information systems. In addition to these more obvious changes, numerous significant changes can be discovered in the details of the revisions.

### Significant Changes from Section 3.4 (Test and Evaluation), DoD Regulation 5000.2-R

**Section 3.4.1 {Test and Evaluation Strategy}.** This section mandates that the various Measures of Effectiveness and Measures of Performance used in the analysis of alternatives, the TEMP, and the acquisition program baseline shall be consistent. This guidance implements a 1992 Office of the Secretary of Defense (OSD) memorandum that addressed inconsistency between the measures used in the cost and operational effectiveness analysis when compared with actual test data.

A second significant revision is the requirement to tailor the test program for nondevelopmental items and commercial off-the-shelf items to recognize past commercial testing and experience. This change formalizes what has been recognized as a "best practice" among the Services.

A third change mandates that potential environmental impacts associated with testing on DoD ranges and facili-



Figure 1. T&E Requirements by ACAT

T&E Requirements	ID & IC	IA	II	III
TEMP in OSD Format .....Yes (DoD Regulation 5000.2-R, app. III)	Yes	Yes	No**	No**
Live-fire Testing .....Yes* (DoD Regulation 5000.2-R, app. IV)	Yes*	No	Yes*	No**
Test Reports to Director, Test, System .....Yes Engineering and Evaluation (DTSE&E) & Director, Operational Test and Evaluation (DOT&E)	Yes	Yes	No**	No**
Mandated OSD ORD Format .....Yes	Yes	Yes	No	No
Beyond Low Rate Initial Production Report Based ....Yes on Initial Operational Test & Evaluation (IOTE)	Yes	No	Yes	No
IOTE .....Yes	Yes	Yes	Yes	No
Operational Assessments .....No	No	No	No	No

\* If provide crew protection, missile or munitions program

\*\* Except OSD Oversight

Note: As part of the TEMP approval process, DOT&E might require an operational assessment and/or IOTE for an ACAT III program that is designated for OSD oversight.

ties be considered. Environmental considerations must be addressed in part 5 of the TEMP.

A fourth change is the requirement to use modeling and simulation (Figure 2), as appropriate, throughout the system life cycle in support of acquisition activities, including test and evaluation. This change reflects the increased emphasis that is being placed on the use of modeling and simulation to reduce costs and to reduce the schedule.

**Section 3.4.2 {Developmental Test and Evaluation}.** A fifth change mandates that developmental test and evaluation programs shall assess the validity of assumptions and conclusions from the analysis of alternatives. This change was enacted to support the requirement to establish linkage and harmonization of test parameters and measures among the key acquisition documents.

A sixth change emphasizes that developmental testing shall be used to assess progress toward meeting critical operational issues. This change was

enacted to reduce the number of shortcomings discovered during operational testing that were previously not identified during developmental testing. Past guidance did address the use of developmental testing to support the decision that the system was ready for operational testing, but failed to specifically mention the assessment of critical operational issues based on developmental testing.

**Section 3.4.3 {Certification of Readiness for Operational Testing}.** A seventh change mandates that the developing agencies formally certify that the system is ready for the next dedicated phase of operational test and evaluation to be conducted by the DoD Component Operational Test Activity. Past guidance was to simply state that developmental testing shall support the decision to certify that the system is ready for operational test and evaluation. The revised guidance mandates that the developing agency provides the following information and assessments prior to formally certifying the system to be ready for the next dedicated phase of operational test and evaluation:

- Software Maturity Criteria
- Performance Exit Criteria
- Risk Management Metrics, Measures, Indicators, and Associated Thresholds
- Mission Impact Analysis of Unmet Metrics

**Section 3.4.5 {Operational Test and Evaluation}.** An eighth change mandates that Operational Test Agencies shall participate early in program development to provide operational insights to the program office and to the acquisition decision makers. This change reflects the increased emphasis on effective use of working and overarching level integrated product teams. Without Operational Test Agencies' participation, these Integrated Product Teams will have reduced effectiveness.

A ninth change is the requirement to structure operational testing to take maximum advantage of training and exercise activities in order to decrease test costs and to increase the realism of operational testing.

A tenth change is a clarification on the use of modeling and simulation in conducting operational assessments. When actual testing is not possible to support an operational assessment, such assessments may rely upon computer modeling, simulations, or analysis of information contained in key program documents. As specified in the old DoD 5000 series, an operational assessment based solely on modeling and simulations will not be used as a condition to proceed beyond low rate initial production. The extent that modeling and simulation is used in conjunction with operational testing must be explained in the TEMP.

**Section 3.4.9 {Live Fire Test and Evaluation}.** An eleventh change delegates the authority to the Under Secretary of Defense (Acquisition & Technology) (USD[A&T]) for ACAT ID programs, and to the Component Acquisition Executive (CAE) for less than ACAT ID programs to waive the requirement for full up, system-level

tests and lethality tests before the system enters the engineering and manufacturing development phase. This revision mandates that the USD(A&T) or the CAE must certify to Congress that live-fire testing of such system or program would be unreasonably expensive and impractical. In addition to the clarification as to who submits Live-Fire Testing and Evaluation (LFT&E) waivers, the LFT&E guidelines are now fully incorporated into the DoD Regulation 5000.2-R. Appendix IV provides details on LFT&E reports and procedures that were not included in the previous version of the DoD 5000 series.

### Key Changes to the TEMP Format

The remainder of this article will address changes that impact test and evaluation planning and execution as documented in the TEMP. Key format changes include removing the 30-page limitation and adding the requirement for the Component test and evaluation director to sign the TEMP as part of the approval process. Other significant changes in the TEMP follow:

- PART 1 Changes
  - List the operational performance parameters (Measures of Effectiveness and Measures of Suitability) from the Operational Requirements Document as a replacement for minimum acceptable operational performance requirements.
  - Ensure the critical technical parameters include software maturity and performance measures.
  - Ensure the critical technical parameters include parameters in the acquisition program baseline.
  - Specify compatibility, interoperability, and integration issues.
- PART 3 Changes
  - Address the degree to which system hardware and software design has stabilized so as to reduce manufacturing and production decision uncertainties.
  - List all models and simulations to be used, explain the rationale for their credible use, and provide

their source of verification, validation, and accreditation.

- PART 4 Changes
  - Move “Live Fire Test and Evaluation” from part 3 to part 4.
  - Follow the guidelines provided in Appendix IV, “Live Fire Test and Evaluation Guidelines,” of DoD 5000.2-R to describe strategy and planning for the system.
  - Address procedures to obtain a waiver prior to Milestone II, when appropriate.

### Most Significant Changes to TEMP

Of the preceding changes to the TEMP format, the most significant are the requirement to list operational performance parameters from the ORD and the expanded requirements in addressing live-fire testing. In the past, the TEMP summarized the most significant thresholds from the ORD as minimal acceptable operational performance requirements. Now the TEMP lists all operational performance parameters from the ORD. For a complicated system with a large ORD, this list can be quite extensive and complicated. For a system that is covered under the live-fire testing legislation, the TEMP must summarize where, when, and how the LFT&E issues will be tested and evaluated. The TEMP must also include a matrix that will cover all tests within the LFT&E strategy; their schedules; the issues they will address; which planning documents the Services propose for submission to the Director of

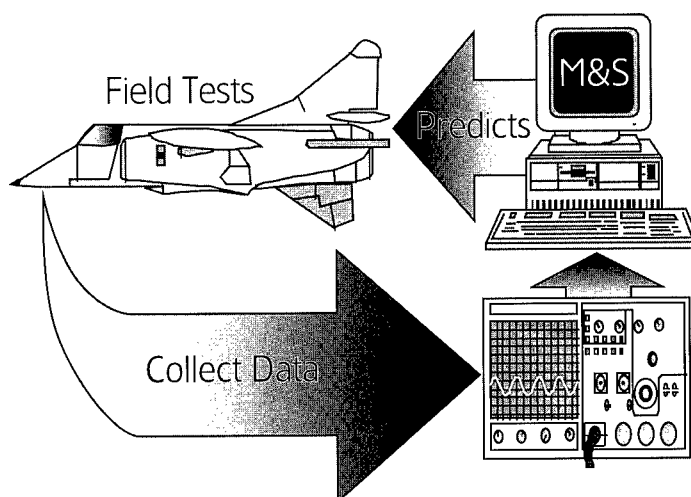
Operational Test and Evaluation for approval; and which documents are proposed for information and review submission only.

### Summary

This article addressed the most significant test and evaluation changes in the revised DoD 5000 series. Numerous less significant, but still important, changes were not addressed. DoD Directive 5000.1 and DoD Regulation 5000.2-R are effective now. Test managers of programs with OSD oversight should obtain a copy of DoDD 5000.1 and DoD Regulation 5000.2-R through their publication support agencies and carefully study those sections referenced in this article. During this study, you should determine what changes are needed in your test and evaluation strategy, and what changes are required in your TEMP to be fully in compliance with the latest DoD guidance.

For programs with documentation approved prior to March 15, 1996, the Integrated Product and Process Development process is ideal for identifying which changes in program documentation are appropriate for immediate implementation, and for identifying which changes are not appropriate or should be implemented at a later date. Good luck...and may you experience great success in implementing your test and evaluation strategies based on this latest DoD guidance.

Figure 2. **Modeling & Simulation**



A N N O U N C I N G

# DSMC Press Announces Publication of *Congressional Involvement and Relations*

## A Guide for Department of Defense Acquisition Managers, 4th Ed.

ALBERTA LADYMON

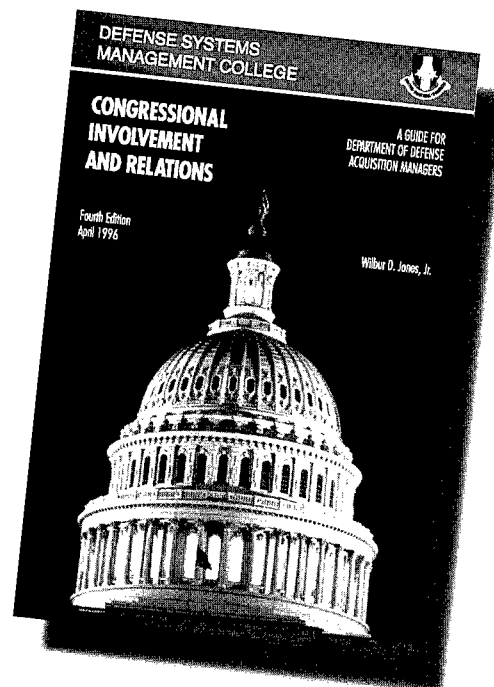
**H**ow does the current Republican-controlled Congress and Democratic-controlled White House change the way the Department of Defense (DoD) acquisition manager (AM) interacts with Congress? Professor Wilbur D. Jones, Jr., Faculty Division, Defense Systems Management College (DSMC), has researched this compelling question and provides insight into Congressional operations in his *Congressional Involvement and Relations*, 4th Ed.

Republicans bring to Congress an ambitious legislative calendar and speed toward agenda accomplishment. There is almost a revolution-type atmosphere on Capitol Hill. Can this revolution sustain itself? No one can predict for sure what impact the Republicans will have on the Congressional system. Although most issues in Congress deal beyond the realm of the DoD AM, the assumption can be made that any weapon system or program can become a chip at the political table. With this in mind, AMs must remain alert to sensitive Congressional and Administrative issues that could impact one's program.

Department of Defense officials must recognize the relevance of the continual changes on Capitol Hill. High turnover rates are draining the corporate experience and knowledge base. As new Members come on board, they are less apt to have military experience and knowledge of DoD programs. Acquisition managers will find themselves educating the Members and their staffs in greater detail on DoD processes and programs.

Regardless of which party controls Congress, the organization and structure remain relatively stable. Congress has two major responsibilities in working with DoD: the legislative process and the oversight function. This Guide educates, informs, explains, and recommends in the broadest sense how DoD AMs should deal with Congressional issues and inquiries. Department of Defense AMs are well advised to respond according to their respective Services' policies and regulations.

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*Ladymon is the Special Publications Editor, Visual Arts and Press, and Quality Coordinator, Division of College Administration and Services, DSMC.*

# Defense Manufacturing Council Chairman Hosts Third PEO/SYSCOM Commanders/PM Conference

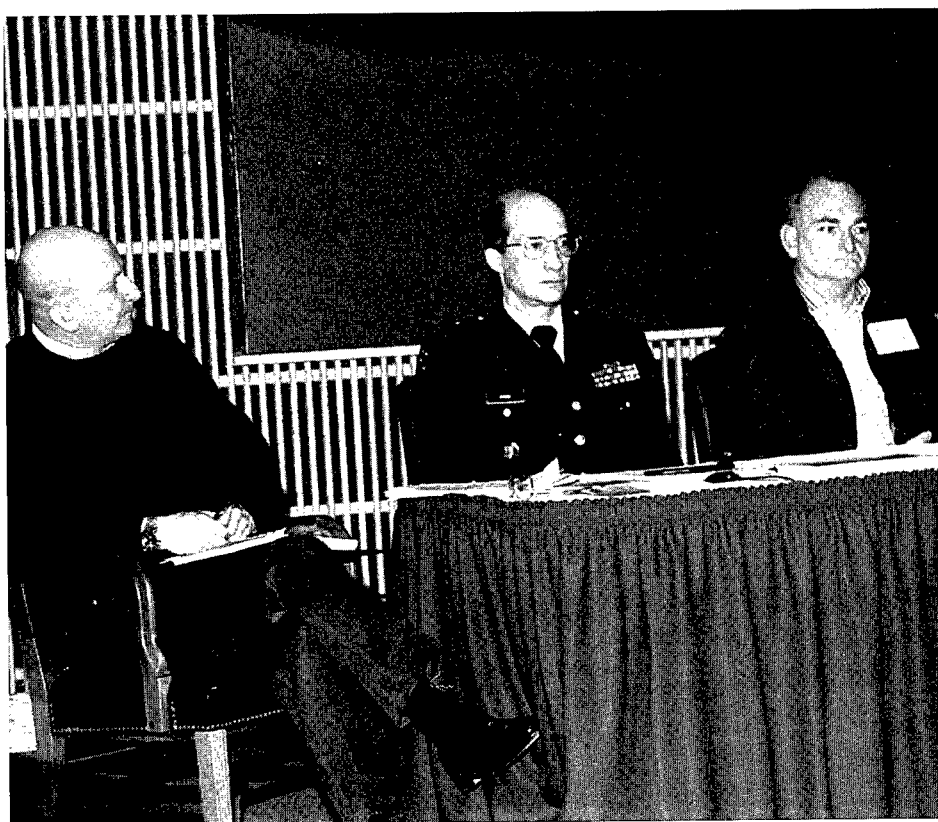
## Understanding Roles/Responsibilities of the Integrated Acquisition Team

DIANE WRIGHT

**U**nderstanding the role and responsibilities of the integrated acquisition team was the theme of the third PEO/SYSCOM Commanders/PM Conference held at the Defense Systems Management College Fort Belvoir main campus, March 26-27.

Principal Deputy Under Secretary of Defense (Acquisition & Technology) R. Noel Longuemare told the attendees that continuous improvement in communication and teamwork is crucial to successful acquisition reform. He emphasized that the overall objective of the conference was to improve communication and enhance understanding of acquisition reform within the integrated acquisition team.

In addition to the classical development community (Program Executive Officer, Program Manager, and System Command organizations), the integrated acquisition team also should include representatives from the budgeting/finance community, the user and requirements community, contracting, test and evaluation, software and industry, among others. Each community has its own individual objectives; but they all must share the mutual objective of acquiring affordable, effective weapon systems for the warfighter. As an example, the comptroller must focus on financing all programs, hardware, agencies, and activities within the



increasingly constrained defense budget. Therefore, the comptroller has a different perspective than the acquirer on weapon system funding. Their actions have significant influence on acquisition program success.

The comptroller, requirement, and contracting communities were specifically selected as a focus for this spring's conference. Through a series

of panels and group sessions, conferees discussed acquisition reform and how to improve the communication and teamwork between the acquisition community and the comptroller, requirement, and contracting disciplines.

The Defense Manufacturing Council, sponsor of the conference, took several action items from the discussions:

*Wright is a Staff Specialist, Air Warfare, Office of the Under Secretary of Defense (Acquisition & Technology).*

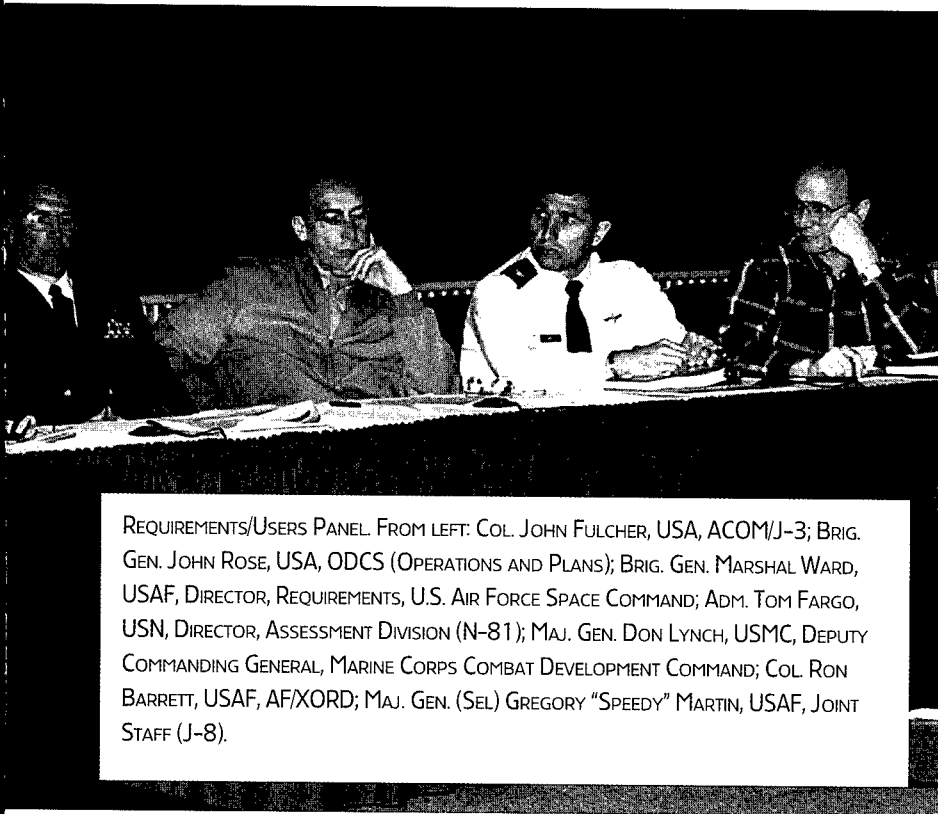
- While the Integrated Product Team approach to acquisition has fostered a strong interface between functional areas, the Services, Joint Staff, and OSD, additional improvements in teamwork and communication were recommended.
- The conferees urged establishment of a stronger interrelationship and compatibility between the Planning, Programming, and Budgeting System (PPBS) and acquisition decisions. This is key to ensuring program execution and financial stability while maintaining the budget and satisfying the other financial obligations.

held on May 31, 1996, at all levels of the community.

Conference invitees included all Service Program Executive Officers; Systems Command Commanders and key staff; selected program managers; key DoD acquisition personnel; representatives of the comptroller, requirements, and contracting communities; and the DMC Executive Committee. The DMC Executive Committee includes the Principal Deputy Under Secretary of Defense (Acquisition & Technology); the Service Acquisition Executives; Under Secretary of

Systems; Director, Acquisition Program Integration; Director, Defense Procurement; and Director, Test, Systems Engineering and Evaluation.

Key speakers at the conference included Hon. John Hamre, Under Secretary of Defense (Comptroller) and Chief Financial Officer; Gen. Joe Ralston, Vice Chairman, Joint Chiefs of Staff; and Hon. Paul Kaminski, Under Secretary of Defense (Acquisition & Technology). Mr. Charlie Trimble, president and CEO of Trimble Navigation, Ltd., was the dinner speaker. Trimble's



REQUIREMENTS/USERS PANEL. FROM LEFT: COL. JOHN FULCHER, USA, ACOM/J-3; BRIG. GEN. JOHN ROSE, USA, ODCS (OPERATIONS AND PLANS); BRIG. GEN. MARSHAL WARD, USAF, DIRECTOR, REQUIREMENTS, U.S. AIR FORCE SPACE COMMAND; ADM. TOM FARGO, USN, DIRECTOR, ASSESSMENT DIVISION (N-81); MAJ. GEN. DON LYNCH, USMC, DEPUTY COMMANDING GENERAL, MARINE CORPS COMBAT DEVELOPMENT COMMAND; COL. RON BARRETT, USAF, AF/XORD; MAJ. GEN. (SEL) GREGORY "SPEEDY" MARTIN, USAF, JOINT STAFF (J-8).

- Further definition is required for the cost/performance trade process that is necessary to keep weapon systems affordable yet effective.
- Keeping the entire community better informed on all aspects of acquisition reform and other cost reduction initiatives is key. As a result of conference feedback, Dr. Paul G. Kaminski, Under Secretary of Defense (Acquisition & Technology), directed an Acquisition Reform Acceleration Stand-Down Day to be

Defense(Comptroller); Director, Defense Research and Engineering; Assistant Secretary of Defense (Industrial Affairs); Deputy Under Secretary of Defense (Acquisition Reform); Deputy Under Secretary of Defense(Economic Security); Deputy Under Secretary of Defense(Logistics); Deputy Assistant Secretary of Defense (Command, Control, Communications and Intelligence Acquisition); Director, Program Analysis and Evaluation; Director, Strategic and Tactical

*Through a series of panels and group sessions, conferees discussed acquisition reform and how to improve the communication and teamwork between the acquisition community and the comptroller, requirement, and contracting disciplines.*

company designs and manufactures Global Positioning System (GPS) receivers for commercial and defense systems. His company has been very successful in reducing component cost by focusing on manufacturing and innovation.

The next conference is planned for this fall.

# PEO/SYSCOM COMMAND

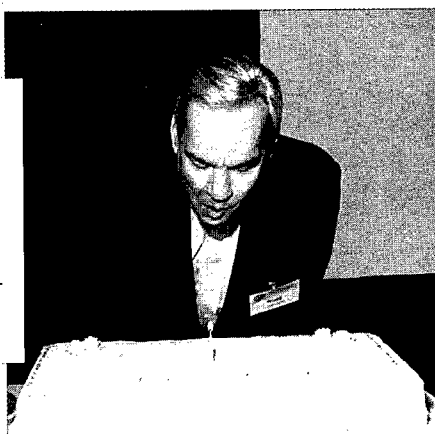


CONFERENCE LUNCHEON  
SPEAKER ON MARCH 26,  
1996 — GEN. JOE  
RALSTON, USAF, VICE  
CHAIRMAN, JOINT CHIEFS OF  
STAFF.



COMPTROLLER PANEL. FROM LEFT: ADM. BILL HANCOCK, USN; BOB STUART, FORCE CIVILIAN; MAURY DONNELLY, ARMY CIVILIAN; RON DAVIDSON, OSD CIVILIAN; IRV BLICKSTEIN, PANEL MODERATOR, OUSD(A&T)/ACQUISITION PROGRAM INTEGRATION.

HAPPY BIRTHDAY MR. SECRETARY!  
PRINCIPAL DEPUTY UNDER SECRETARY OF DEFENSE (ACQUISITION & TECHNOLOGY) R. NOEL LONGUEMARE, CELEBRATES HIS BIRTHDAY AT THE CONFERENCE DINNER ON MARCH 26, 1996.



CONTRACTING/PROCUREMENT PANEL. FROM LEFT: IRA KEMP, FORCE CIVILIAN; REAR ADM. MIKE SULLIVAN, USN; COL. (P) HARRY GATANAS, USA.

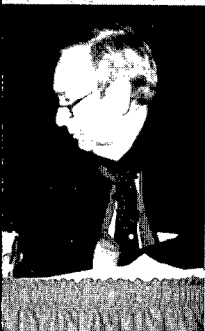


UNDER SECRETARY OF DEFENSE (ACQUISITION & TECHNOLOGY) DR. PAUL G. KAMINSKI, WRAPS UP THE TWO-DAY CONFERENCE.

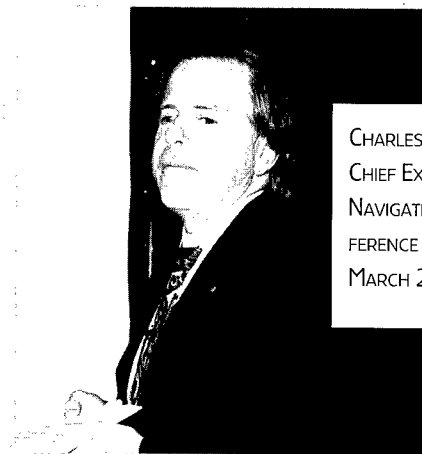


PHOTOS BY RICHARD MATTOX

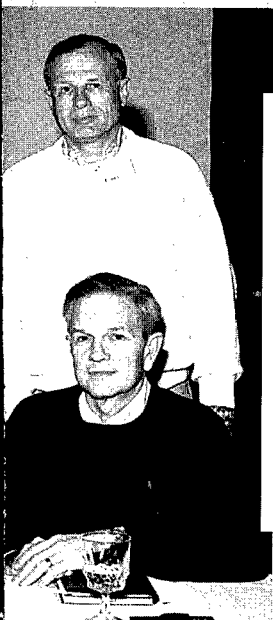
# LEADERS/PM CONFERENCE



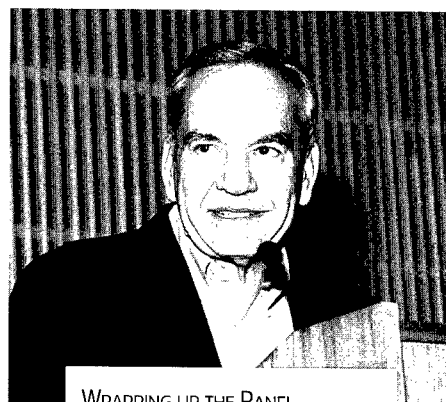
CHARLES TRIMBLE, PRESIDENT AND CHIEF EXECUTIVE OFFICER, TRIMBLE NAVIGATION, LTD., WAS THE CONFERENCE DINNER SPEAKER ON MARCH 26, 1996.



DR. JOHN HAMRE, UNDER SECRETARY OF DEFENSE (COMPTROLLER) AND CHIEF FINANCIAL OFFICER, ADDRESSES THE CONFEREES AT A CONFERENCE LUNCHEON ON MARCH 27, 1996.



SENIOR LEADERS PANEL. STANDING FROM LEFT: HARRY SCHULTE, AFPEO/WP, REPRESENTING ART MONEY, U.S. AIR FORCE SENIOR ACQUISITION EXECUTIVE; GIL DECKER, ARMY SENIOR ACQUISITION EXECUTIVE; GARY SMITH, SPECIAL OPERATIONS COMMAND ACQUISITION EXECUTIVE. SEATED FROM LEFT: R. NOEL LONGUEMARE, PRINCIPAL DEPUTY UNDER SECRETARY OF DEFENSE (ACQUISITION & TECHNOLOGY); DR. PAUL KAMINSKI, UNDER SECRETARY OF DEFENSE (ACQUISITION & TECHNOLOGY); VICE ADM. BILL BOWES, USN, ASN(RDA), REPRESENTING JOHN DOUGLASS, U.S. NAVY SENIOR ACQUISITION EXECUTIVE.



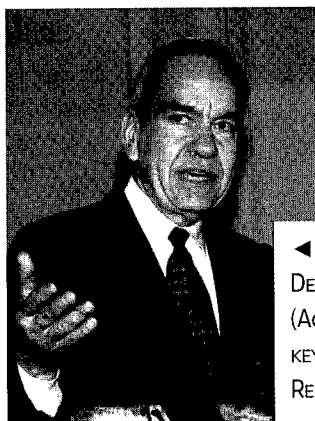
WRAPPING UP THE PANEL SESSIONS — CONFERENCE HOST AND PRINCIPAL DEPUTY UNDER SECRETARY OF DEFENSE (ACQUISITION & TECHNOLOGY), R. NOEL LONGUEMARE.



CONTRACTING/PROCUREMENT PANEL. FROM LEFT: MAJ. GEN. BOB DREWES, USAF, DEFENSE CONTRACT MANAGEMENT COMMAND; ELEANOR SPECTOR, PANEL MODERATOR, OUSD(A&T)/DEFENSE PROCUREMENT.

# ADVANCED PROGRAM MANAGEMENT

## College Graduation



◀ HON. R. NOEL LONGUEMARE, PRINCIPAL DEPUTY UNDER SECRETARY OF DEFENSE (ACQUISITION & TECHNOLOGY) DELIVERED THE KEYNOTE ADDRESS, FOCUSING ON ACQUISITION REFORM INITIATIVES.



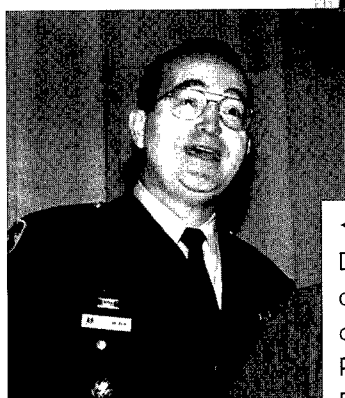
▲ MEMBERS OF APMC CLASS 96-1, FAMILY, AND FRIENDS.



▲ HON. R. NOEL LONGUEMARE AND SERVICE MEMBERS FROM THE MILITARY DISTRICT OF WASHINGTON COLOR GUARD RENDER THE PROPER RESPECT AT THE PLAYING OF THE NATIONAL ANTHEM.



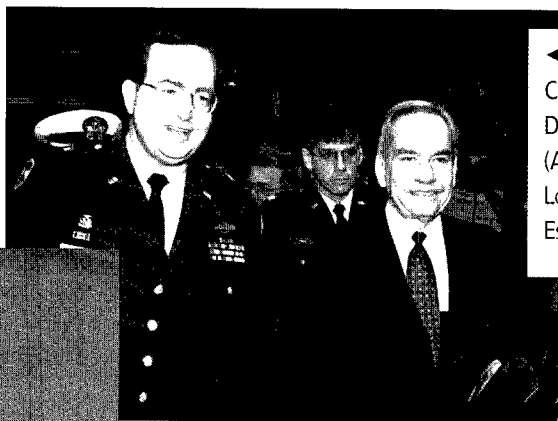
◀ BRIG. GEN. RICHARD A. BLACK, USA, DSMC COMMANDANT, GAVE THE GRADUATION OPENING REMARKS AND INTRODUCED THE GUEST SPEAKER, HON. R. NOEL LONGUEMARE, PRINCIPAL DEPUTY UNDER SECRETARY OF DEFENSE (ACQUISITION & TECHNOLOGY).





# MENT COURSE, CLASS 96-1

## s 420 Students



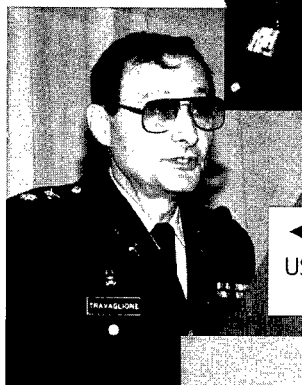
◀ BRIG. GEN. RICHARD A. BLACK, USA, DSMC COMMANDANT (LEFT), ESCORTS PRINCIPAL DEPUTY UNDER SECRETARY OF DEFENSE (ACQUISITION & TECHNOLOGY) R. NOEL LONGUEMARE (RIGHT) AS HE ARRIVES AT ESSAYONS THEATER FOR THE GRADUATION.



WHEN IT COMES TO HANDING OUT DIPLOMAS, THE DEFENSE SYSTEMS MANAGEMENT COLLEGE (DSMC) GETS TO DISTRIBUTE ITS SHARE. BUT RECENTLY, WE THOUGHT OF A BETTER WAY. INSTEAD OF AWARDING 420 DIPLOMAS TO THE GRADUATES OF DSMC'S ADVANCED PROGRAM MANAGEMENT COURSE (APMC 96-1) IN ONE LOOOOOOONG CEREMONY, THE COLLEGE GRADUATED ALL 420 STUDENTS BY AWARDING A SYMBOLIC DIPLOMA TO THE CLASS PRESIDENT, MR. DOUGLAS NEWBERRY, A MEMBER OF THE U.S. NAVY SENIOR EXECUTIVE SERVICE. ON HAND TO AWARD THE OVERSIZE DIPLOMA WAS BRIG. GEN. RICHARD A. BLACK, USA, COMMANDANT, DSMC, JOINED BY PRINCIPAL DEPUTY UNDER SECRETARY OF DEFENSE (ACQUISITION & TECHNOLOGY) R. NOEL LONGUEMARE. PICTURED FROM LEFT: BLACK; NEWBERRY; LONGUEMARE. (EDITOR'S NOTE: STUDENTS WERE ALSO AWARDED INDIVIDUAL DIPLOMAS PRIOR TO THEIR DEPARTURE.)



▲ MEMBERS OF APMC CLASS 96-1, FAMILY, AND FRIENDS.



◀ CHAPLAIN (MAJOR) MICHAEL TRAVAGLIONE, USA, OFFERED THE CLASS INVOCATION.



▲ FROM LEFT: STAFF SGT. HILDRED "JJ" JARRETT, USA, AND SGT. 1ST CLASS MCKINLEY D. "MAC" LEWIS, USA, TWO SENIOR NONCOMMISSIONED OFFICERS FROM THE DSMC STAFF, SERVED AS USHER AND COORDINATOR OF THE GRADUATION RESPECTIVELY.

# Evaluating Concurrent Engineering Programs

MARK E. GINDELE

**P**rogram managers need to look beyond the veil of potential benefits to assess the risks of contractor proposed concurrent engineering efforts. The mere mention of concurrent engineering or its synonym, integrated product team, does not in itself reduce program schedule and cost. Evaluations should center upon the offeror's past success with these initiatives and the fundamental steps leading to their implementation.

In a recent study of several programs involving the manufacture of Aircraft Launch and Recovery equipment, the effects of integrated product teams were assessed. All of the programs studied had been competitively awarded to contractors that subsequently defaulted on their contract. The equipment programs were then

successfully manufactured at the Prototyping and Manufacturing Department at Naval Air Warfare Center, Lakehurst, N.J.

Data from the study indicated the success of the manufacture was directly attributable to the use of integrated product teams. Extensive communication between engineering, manufacturing, and testing teams led to the resolution of problems quickly. Face-to-face meetings were frequent, and issues were resolved in minutes without resorting to technical memoranda or other protracted written documents. Collocation of the team members was considered the most critical factor to gaining any benefits from concurrent engineering.

Further evidence indicated the more complex a system, the more collocation was critical to its suc-

cessful completion. Complexity, when measured by the number of parts, critical interfaces, and final testing requirements was assessed for each program. The more complex programs had employed more frequent and local communication.

Properly employing concurrent engineering and integrated product teams can reduce schedule risk and final cost. Consider informing contractors in the "Instructions to Offerors" section of the Request for Proposal, details of how concurrent engineering programs will be evaluated. Factors such as collocation should be at the top of the list.

**Editor's Note:** Gindele is a Division Manager in the Prototyping and Manufacturing Department for the Naval Air Warfare Center, Lakehurst, N.J.

## DSMC & ROYAL MILITARY COLLEGE OF SCIENCE TO CONDUCT INTERNATIONAL SEMINAR

**T**he Eighth Annual Acquisition/Procurement Seminar focuses on international acquisition practices and cooperative programs. The seminar is sponsored by the International Defense Educational Arrangement (IDEA), an arrangement between defense acquisition educational institutions in the United Kingdom, Germany, France, and the United States.

Those eligible to attend are Defense Department/Ministry and defense industry employees from the four IDEA nations who are actively engaged in international defense acquisition programs. Other nations may participate by invitation. Nations participating in past seminars were Australia, Belgium, Canada, Denmark, Italy, The Netherlands, Norway, Portugal, Spain, and Switzerland.

This year the seminar will be held July 8-12, 1996, at the Royal Military College of Science (RMCS), Shrivenham, Wiltshire, United Kingdom (1.5 hours west of London or Heathrow Airport by train). The last day of the

seminar, July 12, will be an optional day for those interested in the educational aspects of international acquisition.

The IDEA Seminar is by invitation only. Those who have not attended past IDEA Seminars desiring an invitation should contact the IDEA team at DSMC. Those U.S. DoD personnel receiving an invitation should submit an approved DD Form 1556 with a copy to DSMC by telefax. Industry representatives should submit letterhead requests by telefax. Invitations and confirmations will be issued after May 1, 1996.

### For more information, contact: IDEA Team Members

Prof. Richard Kwatnoski  
Director, International Acquisition Courses or Lisa Hicks  
Comm: (703)805-2549/4592  
DSN: 655-2549/4592  
Telefax: (703)805-3175

# EIGHTH ANNUAL INTERNATIONAL ACQUISITION/PROCUREMENT SEMINAR



**JULY 8-12 1996**

Sponsored by the  
**International Defense Educational Arrangement (IDEA)**  
at the  
**Royal Military College of Science**  
**Shrivenham, United Kingdom**

## **TOPICS**

- Comparative National Acquisition Practices
- National Policies on International Acquisition Procurement
- International Program Managers: Government and Industry
- Transatlantic Cooperation
- Intellectual Property Rights
- Special Seminars and Case Studies
- Defense Equipment Displays

There is no seminar fee for qualified participants.  
For further information contact DSMC's IDEA Team on (703)805-2549

# Risk in the F-22 Program

## A Defense Science Board Task Force Analyzes F-22 Concurrency and Risk

MAJ. RICHARD JUSTICE, USAF

**O**n 1 November 1994, the Under Secretary of Defense for Acquisition and Technology (USD[A&T]), Dr. Paul G. Kaminski, requested the Defense Science Board (DSB) establish a task force to "assess the degree of concurrency and risk in the F-22 program."<sup>1</sup> This tasking by USD(A&T) was in response to Senate Armed Services Committee Report 163-282. The specific questions Kaminski wanted answered were:

- Are there any areas in the F-22 program of excessive concurrency? What is the risk in each area?
- For any areas of identifiable high risk, are viable plans/options available that would mitigate the risk?
- What conclusions regarding F-22 concurrency and risk can be drawn by comparisons to existing data on previous fighter/combat aircraft programs?

On April 17, 1995, the Chairman for the DSB Task Force on Concurrency and Risk of the F-22 Program forwarded the task force's final report. The answers, summarized or quoted from the final report, follow:

- No areas of excessive concurrency were identified.
- No areas of high risk were identified. For the eight critical-technical areas the task force identified, each had specific, significant events planned for accomplishment prior to the commit-

ment of significant production funds. The task force identified significant production funds as lot 2 contract award, which is for 12 aircraft. None of the eight critical-technical areas had "alternative, completely independent approaches for the major subsystems," but the task force concluded that "such alternative approaches were neither practical nor needed."

- "The Task Force found that the degree of concurrency for the F-22 program as

observations come as no surprise. Risk management has been integral to the program's management since the early days of the program and deserves significant credit for program success to date and the supportive evaluation from the Defense Science Board.

In this article I address some of the unique risk management tools and techniques applied in the program to



measured by data now available is conservative when compared to other tactical fighters" (see Figure 1, recreated from the same report).

As a general comment the report states, "The overall program appears well structured, sound, and well managed."<sup>2</sup>

Having been associated with the Advanced Tactical Fighter(ATF)/F-22 programs for nearly seven years, these

date. It is not an all encompassing treatment of risk management on the program. To do so would require reviewing the program management in total, which would be too voluminous to publish here.

### Focus on Areas of Highest Risk

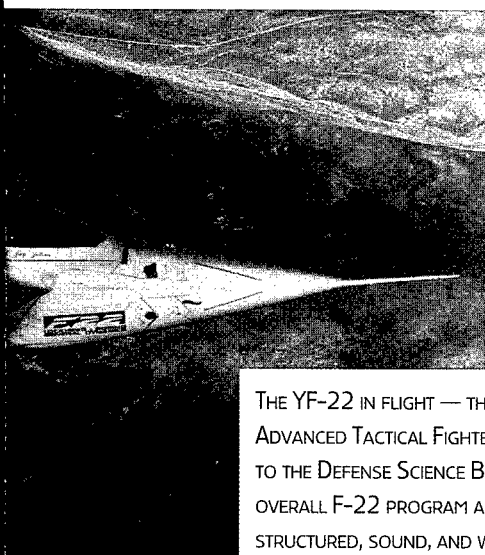
First, it would be useful to define what I mean by risk. I define risk as the potential for negative, unplanned, cost, schedule, or perfor-

*Justice is an F-22 Program Element Monitor, Air Superiority Division, Directorate of Global Power Programs (SAF/AQPF), the Pentagon, Washington D.C. He is a graduate of APMC 96-1, DSMC.*

mance impacts associated with a product, process, or event. Nothing is risk-free. But, our attention needs to be focused on areas of highest risk early in the development cycle; i.e., items that have a combination of a high probability of occurring and significant cost, schedule, or performance impacts as notionally depicted in Figure 2. As the program matures, however, our attention may then be focused on progressively lower levels of risk. The following paragraphs address some of the high points of ATF F-22 risk management.

### Concept Development/Investigation

Phase 0, or Concept Definition/Investigation (CDI) as it was known to the ATF in the early '80s, began the risk management/reduction activities of the ATF. Program planners structured the CDI phase to identify risk areas associated with the concept of the



THE YF-22 IN FLIGHT — THE AIR FORCE'S ADVANCED TACTICAL FIGHTER. ACCORDING TO THE DEFENSE SCIENCE BOARD, "THE OVERALL F-22 PROGRAM APPEARS WELL STRUCTURED, SOUND, AND WELL MANAGED."

next generation manned air-to-air aircraft. Requests for Information sent to industry provided valuable insight into schedule "long poles in the tent" and risk associated with meeting draft operational requirements that were coming together in the System Operational Requirements Document (SORD).

Additionally, government laboratories were providing significant information

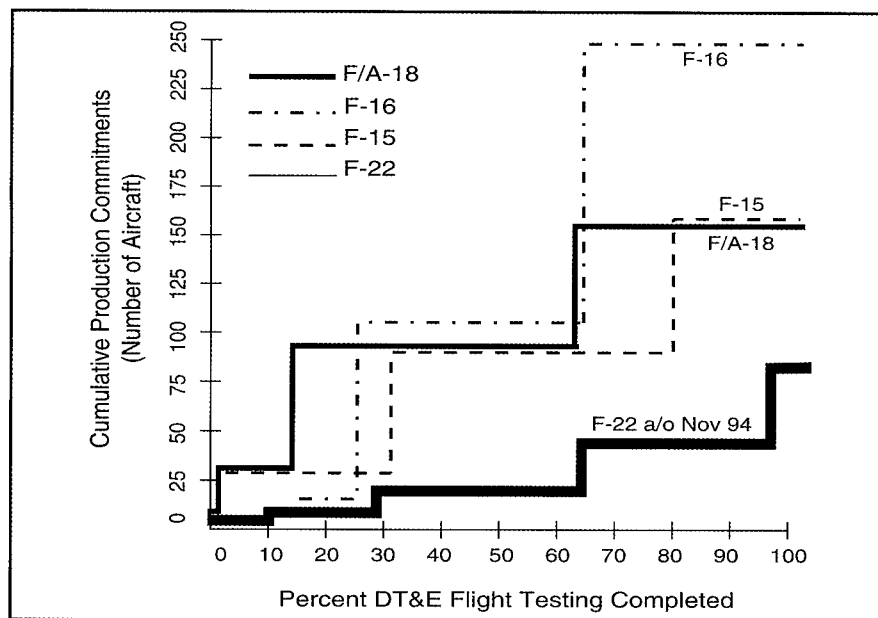


Figure 1. **Concurrency Between Flight Test and Production**

and experience on technologies expected to be required on the ATF, aiding identification of potential risks. According to Mr. Tom Graves, Deputy Director of the F-22, the product of the phase was a list of technologies and processes that were needed for the ATF concept to be feasible. These technologies carried varying degrees of risk. Program planners structured the Demonstration/Validation (Dem/Val) phase to address the most significant of these risks prior to entering the Engineering and Manufacturing Development Phase (EMD). Examples of such high risk areas included:

- manufacturing aircraft structure from composites;
- integrating avionics sensors to provide a composite air picture;
- demanding signature reduction in a highly maneuverable air-to-air aircraft;
- supersonic cruise in military power (supercruise); and
- improved reliability, maintainability, and supportability.

The development of a cooperative partnership between the user, represented by Headquarters, Tactical Air Command, and the developer was

another significant start toward reducing risk during CDI. Much give and take would be required between the user and developer as the program matured. Flexibility would be key in delivering a product that properly balanced cost and performance.

### Demonstration/Validation (Dem/Val)

In 1986, the ATF System Program Office (SPO) awarded four firm fixed price contracts: two for competitive development of the Air Vehicle (including all training and support systems), and two for competitive development of an engine. Program planners structured the contract requirements to reduce risk in what was felt to be the highest risk areas and to develop a comprehensive Preferred System Concept (PSC), which the winner would carry into EMD. Specifically, each Air Vehicle contractor team was expected to complete the following actions:

- Prototype an air vehicle and conduct reasonable flight test demos on:
  - all airframe/engine combinations (two air vehicles per team);
  - maneuverability in a low observable design fighter; and
  - supercruise.

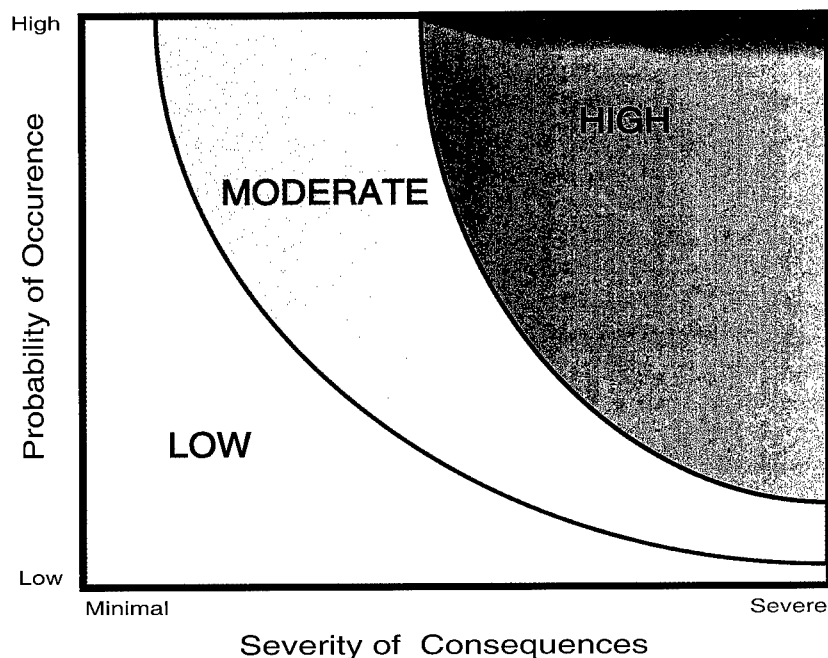


Figure 2. **Degrees of Risk**

- Demonstrate avionics integration/prototype through:
  - avionics ground prototype to provide preliminary integration/architecture; and
  - Avionics Flying Lab and “up and away” sensor performance.
- Demonstrate low observables of PSC through testing of full-scale pole models.
- Develop materials concept.
- Analyze system effectiveness.
- Analyze pilot effectiveness.

While these contract requirements tried to force significant risk reduction, competition provided tremendous incentive for the teams to reduce as much risk as possible during the four-year contract. The system concept with the lower risk at the end of Dem/Val would have a distinct advantage when it came time to award the “winner take all” EMD contract. As such, competition was a major risk reduction tool.

User involvement was another key to risk reduction. Dem/Val saw a number of key cost/performance/risk trades that required SORD changes or, as a minimum, user concurrence. Examples are the elimination of the Infrared Search and Track sensor, radar side arrays, and thrust

vector reversing. In addition to supporting major trade decisions, Tactical Air Command representatives helped reduce risk by providing continuous feedback on design concepts, cockpit layout, tactics, and maintainability. This prevented the SPO and contractor from getting out of step with their customer and helped minimize misinterpretation of requirements.

Aside from the typical meetings and reviews, the program manager used several tools to specifically manage risk. Two such tools were: the risk reduction profile (Figure 3) and the Technical Performance Measure (TPM) (Figure 4). The risk reduction profile charted the level of risk versus time for a specific risk item. As time progressed, program technical experts conducted events designed to reduce risk through tests, analyses, demos, etc. Figure 3 reflects the technical experts’ expectation of the remaining risk after each event, with the profile hopefully terminating in low- or low-moderate risk entering EMD. Risk reduction profiles provided benefit in two ways. First, developing the profile plan facilitated significant learning and helped reduce risk through understanding. Second, the profile created a logical process that

could be tracked and adjusted as time progressed.

Additionally, TPMs tracked progress toward meeting performance requirements of the system and were influenced by risk reduction profiles. The example risk profile is for manufacturing low-cost thermoplastic composites. This risk reduction profile would have affected the design-to-cost TPM. If risk was satisfactorily reduced and the process incorporated into the PSC, the design-to-cost TPM would reflect the lower cost of these thermoplastic composites and a lower aircraft unit cost. You can see how broad TPMs like design-to-cost could be affected by many risk reduction efforts.

To communicate quickly with top management, the program office formatted all TPMs the same. Once the following code was broken, management could quickly assess the situation with any of the measures:

- Thick black lines represent tolerance bands, both upper and lower. Going below the lower band would indicate an unacceptable position, and increased emphasis is required to bring the parameter back within acceptable bounds. The lower tolerance level also narrows over time, in keeping with the need to reduce risk as time passes and demonstrate an ability to close in on performance requirements. The upper level is there to indicate when this area may be a good source to be traded off to the benefit of another, unacceptable risk. Performance above the upper tolerance band was viewed to have little benefit.
- The dashed line represents the objective.
- The solid line at 100 percent represents the requirement.
- The dotted line represents the plan for getting to the requirement.
- Triangles represent the current estimate of what would be attainable.
- Solid circles represent capability demonstrated (achieved) to date.

The last Dem/Val risk reduction tool I want to touch on is the involvement of Air Force laboratories. They are tremendous assets that frequently don't get the credit due for their support of acquisition programs. The labs were instrumental initially by identifying risks for the program during CDI, and in Dem/Val continued to be instrumental. Laboratory-funded research aided in reducing risks associated with manufacturing technologies; integrated avionics; the active, electronically scanned array radar; and numerous other risk areas. Laboratory efforts contributed significantly to ATF's successful Milestone II review in 1991.

**The contractor and government were going to be in lock step because in the eyes of the ATF leadership, if the contractor failed, the government failed.**

Figure 5 accurately summarizes Dem/Val. The phase started with large uncertainties and the inherent risks of the unknown. These uncertainties existed due to a lack of data. As Dem/Val progressed, contractor- and (to a lesser extent) government-generated data fed the transition from the user's SORD into increasingly refined versions of the Preliminary System Specification and an increasingly defined contractor PSC capable of meeting the requirements of the system specification. The result was a match of requirements and doable technologies to baseline an executable program at EMD start.

### Engineering and Manufacturing Development (EMD)

Before EMD began, the program office was refining the most significant risk reduction tool. The use of Integrated Product Teams (IPT) was going to be a contract requirement. No longer would it be acceptable for the system engineers to allocate requirements in a vacuum, designers to design in a vacuum, manufacturing to build simply as directed, and inspectors to inspect in quality after the fact. The IPT would involve all applicable functional disciplines up front so each successive step in the process of building a new system would not be reacting to the preceding step. The theory was to design a part that was suitable, manufacturable, repeatable, testable, and sup-

this required additional manpower resources up front, the payoff should be seen dramatically as the program moves into producing systems.

Not only did IPTs include all applicable contractor functionals, but also included government representatives as well. The program established one radar IPT, one airframe IPT, and one support system IPT, which consists of government and industry personnel. The contractor and government were going to be in lock step because in the eyes of the ATF leadership, if the contractor failed, the government failed. The entire contractor/government team had to be committed to the successful execution of the ATF, soon to become the F-22 program.

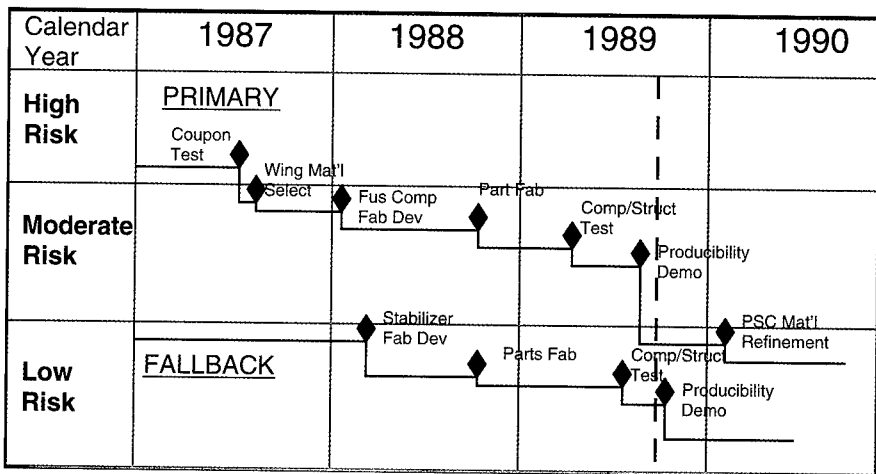
In looking back, Mr. Jon Ogg, Chief Engineer on the F-22, attributes much of the EMD program success to the IPTs. He believes the cooperative government-industry teaming relationship fostered effective two-way communication and a "can-do" attitude in the workforce. Armed with those two qualities, no issue has surfaced thus far that the program has been unable to resolve.

portable from the start. By doing this, we reduced the risk of redesign and the accompanying cost and schedule impacts of scrap and rework. While

To aid the IPTs, the government and contractor developed the Integrated Master Plan (IMP) and the Integrated

Figure 3. **Example Risk Reduction Profile**

Risk Issue: Low Cost Thermoplastic Composites  
Fallback: Toughened C14 BMI Thermosets



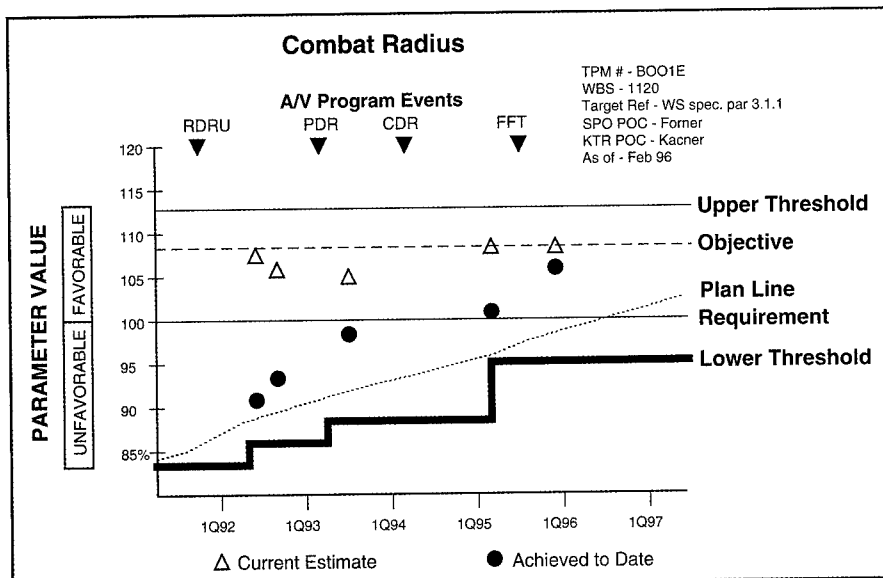


Figure 4. **Technical Performance Measure**

Master Schedule (IMS). The IMP is a detailed listing of accomplishments (e.g., preliminary design of the avionics bay racks) that must be completed by established milestones (e.g., Preliminary Design Review) or the milestone cannot take place. The IMP is integral to the concept of an event-driven program. If the work isn't complete, the milestone will not take place. The IMP is part of the EMD contract. And while event-driven management doesn't tie itself to a calendar, scheduling must still be accomplished so that all teams have a common target date for accomplishing tasks leading up to a milestone. This is the IMS. The IMS lays out all IMP tasks on a schedule. But the IMS is not a contractual document and, as such, can be adjusted as necessary without contracting action.

Another significant risk management change from Dem/Val to EMD was the change to a cost plus award fee contract. With competition over, some incentive was required to properly balance cost, schedule, and performance of the EMD program and ensure continued risk reduction. The Award Fee provided this incentive, and program planners structured the Award Fee Plan to incentivize the combination of a balanced approach and continued risk reduction. Particularly beneficial to risk management is the ability of the program office to tailor the subject

ive award fee criteria for each award fee period (a period is six months long). By focusing a portion of the award fee criteria on a particularly difficult risk, additional incentive can be placed on the reduction of that risk. Control/reduction of overhead and aircraft weight are two examples of risks previously incentivized through the Award Fee Plan. Overall, the objective of the Award Fee Plan was to balance cost, schedule, and performance. Any one that was overly emphasized would come at the expense of the others. Proper balance was, and is, the objective of the F-22.

The EMD contracts were awarded in August 1991. The task was to take the risk remaining from Dem/Val and reduce it through detail design, manufacture of test aircraft, and test. The use of TPMs was expanded, and these measures are now used to track over 250 separate metrics. It was the weight TPM that on two separate occasions flagged unacceptable trends in aircraft weight. In response, SPO and contractor personnel conducted short-term, intensive weight reduction efforts, driving weight back within acceptable bounds.

A similar problem was discovered in December 1993 through the Radar Cross Section (RCS) TPM. This resulted in a massive effort to reallocate RCS

budget to some components and conduct minor redesign on others. While this was not a welcome exercise, by identifying the problem early, the cost to correct the deficiency was dramatically less than it would have been had it been caught three-four years later as would have been typical in previous programs. Ogg estimates the cost to correct this deficiency three-four years down the road would have been \$100-200M. The cost to fix in 1994 was approximately \$19M.

One other major risk reduction initiative that is paying huge dividends in EMD is the System/Software Engineering Environment (S/SEE). The S/SEE is a risk reduction tool whose development was begun in Dem/Val but came to fruition in EMD. It is a nationwide set of VAX workstations connected through a common VAX-VMS network. It provides a common environment allowing information to be shared by the geographically dispersed contractor and government facilities developing the F-22. In spite of what the name implies, its application is not limited to the software development community. According to Mr. John Howard, the government's lead engineer for the Common Integrated Processor and one of the founding fathers of the S/SEE, the S/SEE's application was originally envisioned as a software development tool only, but evolved into weapon system-wide application.

Up to now, I've discussed risk more from a technical perspective. But our processes within DoD tend to induce internal management risk, especially for a program the size of the F-22 EMD. This risk can be exacerbated by misleading publications that tend to overstate problems while ignoring or treating lightly, successes. Without adequate, accurate information reaching senior leadership, we risk making decisions on inaccurate reports resulting in undesired effects.

To mitigate this risk, it is critical for the program to keep senior leadership accurately informed. To this end,



"Chief Executive Officer" (CEO) meetings were arranged. Every six months, the major stakeholders are brought together to discuss program status and issues. These stakeholders include the Secretary of the Air Force, Chief of Staff of the Air Force, Air Combat Command (ACC) Commander, Air Force Materiel Command Commander, Program Executive Officer (PEO), system program director, contractor program manager, and company CEOs and presidents. In addition to the benefits of keeping these leaders informed, I'm told it's amazing how fast a nagging program issue can be resolved when presented to this body!

The program cannot take credit for the last risk reduction tool I want to discuss. But of all the tools being used in EMD, I believe this one has the most potential for improving the F-22s' acquisition processes and reducing self-inflicted risk. In May 1995, Dr. William J. Perry, Secretary of Defense, directed the application of the principles of Integrated Product and Process Development (IPPD) in the oversight and review process.<sup>3</sup> This is not to be confused with the implementation of IPTs in the SPO. While the SPO approach to management changed to IPTs in 1991, oversight and review remained organized along functional lines. The result was a program office working toward a balanced product, while oversight and review organizations worked to perfect each individual functional discipline.

The change in philosophy required by IPPD implementation in oversight and review makes it unacceptable for staff organizations to roll in at the last second looking for a problem. Early involvement is required, and issues must be raised early in the process so they can be dealt with. All functional organizations are required to recognize the need for balance in a program and that no one area can be optimized because it ultimately comes at the expense of another. All functional team members must be committed to successfully executing the directed program, even if their area is less than perfect.

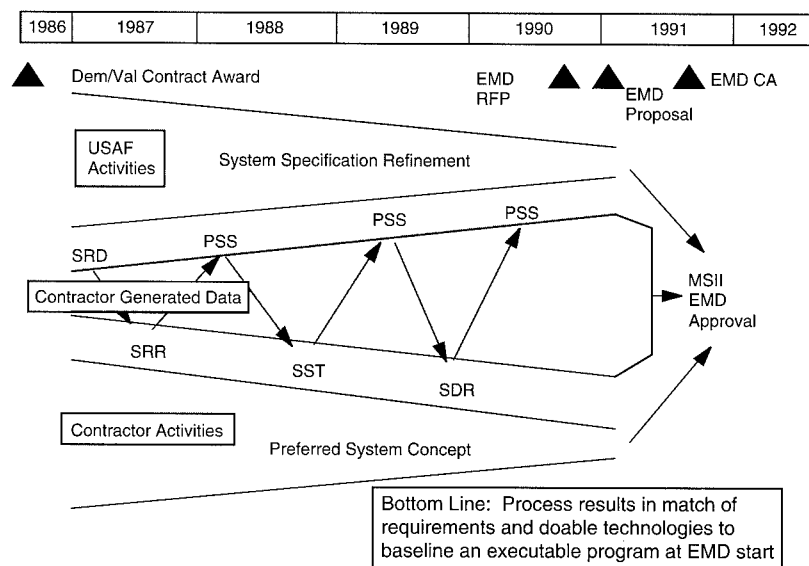
**The Packard Commission recognized excessive leadership turnover in acquisition as one of the significant sources of problems. To their credit, Air Force leadership recognized the importance of this finding and allowed SPO directors to stay for significant periods of time and be promoted in position.**

Some view this change as an abrogation of the oversight responsibility. I disagree. Oversight can be conduct-

ed in keeping with the principles of IPPD. In evaluating programs within their oversight realm, overseers must identify perceived problems and offer suggested improvements. The objective is to identify problems early enough to correct them so that the program has an improved chance of succeeding. Viable IPPD requires functional overseers to understand impacts on other areas and be willing to work toward a position that is the best for the program as a whole.

In compliance with Perry's direction, the F-22 established an Overarching IPT (OIPT), composed of applicable offices from the previous Defense Acquisition Board committees; the PEO; user and program director; and a Weapon System IPT (composed of action officers from key offices in the Air Staff, Secretariat Staff, J-Staff, and Office of the Secretary of Defense). Principles of IPPD are taking time to sink in, but the previous relationship with the staff that bordered on adversarial has clearly started to change. The implementation of IPPD principles can make a tremendous difference in this area. So far, our experience with IPTs in the Pentagon is encouraging.

Figure 5. ATF Dem/Val Process to Define Requirements



I would be remiss if I didn't recognize the stability of the ATF and F-22 leadership as a major contributor to risk management. The Packard Commission recognized excessive leadership turnover in acquisition as one of the significant sources of problems. To their credit, Air Force leadership recognized the importance of this finding and allowed SPO directors to stay for significant periods of time and be promoted in position.

### Toward Production

The program office, in concert with the OIPT and the action officers that support it via the Weapon System IPT, is actively planning the transition to production. Risk continues to be managed during this period using previously identified tools, but we have an additional yardstick to be measured by. After the Milestone II decision, exit criteria were established for moving into the various stages of production. Like the IMP mentioned earlier, this

concept is a cornerstone of the event-driven philosophy. Until the criteria are met, the program will proceed no further. Specifically, the F-22 has unique exit criteria for seven distinct production-related milestones, starting with contract award of the Pre-Production Verification Aircraft and culminating with Milestone III approval. Each of the seven milestone exit criteria requires demonstration of progressively less risk and an increasingly mature system before committing the increasingly large dollars associated with each successive production milestone. With this highly structured, event-driven transition to full-rate production, the Department of Defense will avoid committing significant production dollars to a program containing excessive risk.

### Conclusion

The DSB found F-22 concurrency to be conservative relative to previous fighters, found no areas of high risk,

and felt logical plans were in place to deal with risk that remains. This healthy program position can be attributed to proactive, tailored risk management, fostered by a forward-leaning leadership. Continued success cannot be guaranteed, but is certainly expected.

### REFERENCES

1. USD(A&T) Memorandum, "Terms of Reference - Defense Science Board Task Force on Concurrency and Risk of the F-22 Program," November 1, 1994.
2. Report of the Defense Science Board Task Force on Concurrency and Risk of the F-22 Program, April 1995.
3. SECDEF Memorandum, "Use of Integrated Product and Process Development and Integrated Product Teams in DoD Acquisition," May 10, 1995.

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◀ THE DEFENSE SYSTEMS MANAGEMENT COLLEGE SCORED A HIT WITH ITS NEWEST EXHIBIT, WHICH DEBUTED AT THE FEDERAL OFFICE SYSTEMS EXPOSITION (FOSE 96) AT THE D.C. CONVENTION CENTER, APRIL 2-4. BUT THE BIGGEST HIT BY FAR WAS THE COLLEGE'S CHOICE OF "DAVE CAVE" (A.K.A. ED BOYD) AS THE RESIDENT NEANDERTHAL. IN FACT THE EXHIBIT WAS SO WELL RECEIVED, IT WAS UNOFFICIALLY NAMED THE MOST ORIGINAL OF THE EXPOSITION. (EDITOR'S NOTE: "DAVE CAVE" IS A DSMC STAFFER WHOSE DAYTIME JOB IS VISUAL INFORMATION SPECIALIST, DSMC VISUAL ARTS AND PRESS. HOWEVER, WORD ON THE STREET IS THAT HE'S BEEN INVITED TO A "CAST CALL" FOR THE CINEMA PRODUCTION OF "FLINTSTONES II.")



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## FROM THE COMMANDANT

I feel a tremendous sense of anticipation as I begin this assignment as Commandant of the Defense Systems Management College (DSMC). The challenges facing the acquisition workforce are greater now than at any time in the nation's history. Rapid changes in the policy and practice of both government and commercial sectors, steadily eroding modernization budgets, evolving strategic requirements, and the revolutions in microelectronics and digital technologies have combined to create an environment where change is constant. We at DSMC have accepted the challenge and will thrive in this environment. We will also ensure that we educate the acquisition workforce so they can excel in a climate of change.

On the 25th of June we celebrated the 25th Anniversary of the College with a day set aside to remembering the contributions of the people who have worked to make DSMC great. Many of the past commandants were present as we dedicated our executive conference center as the "David Packard Conference Center" and reaffirmed our commitment to his vision of the College as a center of excellence for teaching defense systems acquisition management. As we move into our second quarter century, we will achieve this goal by: *providing on-campus capabilities for on-site and distance teaching to the workforce; providing research to improve the acquisition system; providing consulting services to acquisition managers; and disseminating acquisition information.*

One of our most important challenges is to use the rapid evolution of information technologies to keep our workforce up-to-date. We have conducted courses via closed circuit television and have had live broadcasts of distinguished speaker's remarks to our regional distance learning

centers. We have a working World Wide Web DSMC Home Page that thousands of users access for information on acquisition reform initiatives, research, and expertise. In the coming months we will expand our distance learning efforts to enable us to reach all of the workforce with continuing education using information technology. We expect to add classes on CD-ROM, expand our web site, and develop teaching methods that will allow students to receive our instruction at their home stations through a variety of media leading to "broadcast education training." This growing ability to bring our educational products to the workforce will enable us to focus on their specific needs via electives and offer new courses that are tailored to provide updates based on the latest acquisition reforms and best practices.

I am very proud to be a part of this critical education effort. As DSMC evolves to better serve our customers, we will maintain our focus on the education and training of the entire acquisition workforce, and ask that each of you help us to continuously improve the capabilities of the finest acquisition professionals in the world.

—Brig. Gen. Richard A. Black, USA  
Commandant

